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# THE RELATION OF SCIENCE AND PHILOSOPHY

UNIVERSITY

A THESIS

SUBMITTED TO THE UNIVERSITY OF TORONTO FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

BY ROY BALMER LIDDY

MAY 1914

UNIVERSITY PRESS
TORONTO

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To the Senate of the University of Toronto:

Gentlemen:

I beg to recommend that the Thesis entitled "The Relation of Science and Philosophy" submitted by Mr. Roy Balmer Liddy be accepted as fulfilling part of the requirements for the Degree of Doctor of Philosophy in this University. I certify that it is a distinct contribution to the knowledge of the subject.

(Signed) F. Tracy,
*Associate Professor of Philosophy and Chairman of the Board of Examiners of the Department of Philosophy.*

*May 15th, 1914.*

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I hereby certify that the Thesis above-mentioned has been accepted by the Senate for the Degree of Doctor of Philosophy, and that Roy Balmer Liddy, M.A., has complied with all the regulations respecting this Degree, as defined in the Statute of the Senate in that behalf.

(Signed) James Brebner,
*Registrar.*

*May 19th, 1915.*

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# INTRODUCTION.

The aim of the following pages is to investigate the problem of the relation of science and philosophy. With this end in view, it has been found advisable to make an examination of their respective histories. For, when the actual, historical course of those investigations known as science and philosophy is traced, there are unfolded the various relations which each, throughout its long history, has borne to the other. By the same method, likewise, there ought to emerge, as a result of analysis, a definition of science and a definition of philosophy which should be adequate and just to the entire development of each. Definitions formed in any other way can, only by the merest chance, be applicable to the history of disciplines which show such complex developments. Definitions formed in any other way must necessarily be, to some degree, arbitrary, and, as such, will almost inevitably lead to a misunderstanding and even a depreciation of the work of men who have lived in times earlier than and different from our own.

After such an historical survey has been completed, there ought also to result a clearer comprehension of the relation that should exist to-day between science and philosophy, investigations which, as is well known, have in their development exhibited toward each other attitudes varying from that of bitter antipathy to that of friendly and co-operative sympathy.

It is at least theoretically possible that philosophy has to investigate a content quite other than that of the sciences. If this be so however, it surely would be an acceptable service on the part of someone to point out what this content is,—a content which is sometimes vaguely referred to as the phenomena of mind. On the other hand, it may be that the content of philosophy consists in the general processes of the various sciences to which may be added the phenomena of social and religious life, and that its task is to examine and synthesize this ever-growing body of data. Which of these is the genuine task of philosophy it is the aim of this thesis to indicate.

The plan, then, to be followed, leads, first of all, to a glimpse into that religious background whence there evolved gradually those intellectual operations which afterwards became differentiated into certain special sciences and philosophy. A brief survey of these early special sciences enables us then to form some conception of what science endeavours to do. And, similarly, the aim of philosophy is revealed by a consideration of the work of Plato and Aristotle. Following upon this we see science and philosophy both subordinated to speculative theology, but from this unfortunate bondage the sciences, by the use of an adequate method, began slowly to emerge, until, at last, to a large extent, untrammelled, free and relatively united, they were able to continue their splendid investigations. On the other hand, in the realm of philosophy, modern empiricism and modern rationalism arose, becoming more and more opposed, until Kant, showing the onesidedness and inadequacy of each, endeavoured to formulate a better way for philosophy to discharge its important task. Thus, in the concluding chapter, we find ourselves in a position where we can see, though, perhaps, not yet so clearly as might be desired, the proper relation of science and philosophy exhibited in the performance of their respective tasks.

# CHAPTER I.

## The Religious Background.

In the first book of that part of his work which is known as his Metaphysics, Aristotle gives a critical review of certain Greek thinkers, among whom he names Thales as the founder of the first school of philosophy. For this reason, mainly, succeeding historians have generally commenced their outlines of Western philosophy with an account of this early thinker.

It is unlikely that Thales committed any of his teaching to writing. If he did, not even a fragment appears to have survived the tooth of time. The traditions, however, which centre around his name are many, and some of these are fairly authentic. Those which most interested Aristotle are mainly cosmological in their nature, and, if one follows Burnet, they may be reduced to the following three:—

(1) The earth floats on the water.
(2) Water is the material cause of all things.
(3) All things are full of gods. The magnet is alive; for it has the power of moving iron.[1]

Whether these statements represent the teaching of Thales at all accurately it is difficult to determine. The terminology of the second statement is, of course, Aristotelian, and it is very probable that the Stagirite has interpreted the tradition in the light of his own special philosophical system. However, it is doubtless safe to conjecture that Thales was seeking the nature of the primary stuff of all things. The word, which he most likely used to designate this primary substance, was not the Aristotelian ἀρχη but probably the word φυσις. His work, and that of all the philosophical writers of the sixth and fifth centuries B.C., might have been entitled περι φυσεως. What is φυσις? This constituted their problem. The answer which Thales gave was, φυσις is water. The nature of things, or the primary and fundamental something,

[1] J. Burnet, Early Greek Philosophy, Pp. 47-8.

which persists throughout all change, that it most probably was which Thales designated as water.

The first part of the third statement is of special interest because it provides a clue by means of which the historian may be enabled to trace something of the origin of these conclusions. "All things are full of gods", this is a statement which has religious significance; it shows without doubt the influence of religious views, and it may be quite possible that these early thinkers, called by later writers, philosophers, were much more affected by the religious views which had come down to them from the ages of Homer and Hesiod and even earlier times than has generally been supposed.

When an effort is made, however, to trace the genesis of the ideas of the early Greek philosophers, one is tempted to give up in despair. The atmosphere one breathes, when he turns from the mythical representations of Homer and Hesiod to the work of Thales and his school, seems so much purer and clearer that one is led, at first thought, to affirm that there is no relation between the two periods except one of opposition and antipathy. It would, however, be very strange if there could not be found some degree of sympathy between the earlier period, called religious, and the later period, called philosophic. Thales did not, like the Adam of tradition, open innocent eyes upon a new and uninhabited world. Men and women had been living and thinking long ages before he taught that the principle of all things is water. From his predecessors he had inherited certain traditional views, and, though it was his task and his glory to advance upon that intellectual environment, yet he could not and did not break away entirely therefrom.

It has often been held that Greek philosophy traces its origin to Oriental influence. There, it is said, is to be found the true background of Greek thought. It would be quite erroneous to deny that Egyptian mathematics and Babylonian astronomy influenced the philosophy of the Greeks, but it would be an even greater mistake to overlook the influence also of the religious ideas of pre-Homeric and Homeric times.

Now to depict the development of Greek religious ideas before the time of Thales is not an essential part of the task to be under-

taken here. But it is, nevertheless, necessary to outline very briefly the religious conditions which prevailed in Greece when, according to Aristotle, that change arose which produced what has been called philosophy. This is necessary for two reasons. First, it will help to differentiate the philosophical attitude from that which preceded it. What were the features which made the work of Thales, apparently, so different from that of Homer and Hesiod? We say the atmosphere we breathe when we study the Ionian philosophers is purer and clearer. What is meant by this figurative language? An outline of the earlier periods should answer this question. Secondly, such an outline is necessary because, in seeking a definition of science, it is highly important to study it in its first vague glimmerings. And, though this religious history may seem at first sight a veritable jungle-land of contradictory myths and legends, yet there is to be seen amid "the dark primaeval tangle of desires and fears and dreams" the ever fascinating struggle of mankind toward clearer vision. In that struggle, be it religious, moral or intellectual, man is always exhibiting that attitude of mind which, after our investigation, we shall be enabled to term scientific.

It has been the custom, too frequently, to relegate to prehistoric darkness the pre-Homeric era. It is still, no doubt, in many ways, a region misty and half-lit. Recent literature, however, has been emphasizing its importance, and modern scholarship has been able to trace out with some fair degree of accuracy many of the customs and magical rites which prevailed long before Olympus was peopled with the gods of Homer. Gilbert Murray[1] calls the first stage of religious growth among the Greeks, Primitive Euetheia or the Age of Ignorance. Dr. Preuss has applied to the same period the word Urdummheit or Primal Stupidity. In man's long toiling upward, that age, however, was, doubtless, a great advance upon earlier periods of which nothing is known. In regarding the efforts of men, who have lived in the past, there is need of a spirit of generosity, or, rather, of simple honesty, which sees in their strivings earnest efforts after the better. However, the name, by which that early stage in the development of Greek religion is denoted, matters nothing, if only the investigation be

[1] Four Stages of Greek Religion.

carried on in that admirable spirit of tolerance and appreciation exhibited in so beautiful a manner by such writers as Murray, Harrison and others.

This first stage is claimed by Murray to be characterized by three things,—first, an atmosphere of religious fear; secondly, a whole sequence of magical ceremonies, and thirdly, a divine or sacred animal.[1] The Olympian gods were not known at all. They were a later invention. These conclusions, the result, mainly, of the analysis of three great festivals which were held, appear quite worthy of credence. If one asks the origin of this "atmosphere of religious fear", of the magical ceremonies and of the reverence shown to snake and pig and bull, the answer can only be conjectural. The dreams of primitive man, his strong emotions, his many memories, his vivid imaginations, the surprises which were constantly meeting him in his daily life, caused by storm and famine and earthquake, and, again, by sunshine and fertilizing rain, the pain he was at times forced to bear, death, with its sad and strange results,—these led him to dread and fear, and, finally, to appease and mollify or give thanks to the agencies which he gradually came to believe must surround him, agencies which were imaginative constructions made from his own experiences.

To the average child the tree, the chair, the doll are all alive. The pre-mundane existence whence he comes, according to the poet, "trailing clouds of glory" seems not to save him from many vague fears and superstitions. Those, who are older, watch his naive play and conclude that he has, in some way, clothed with life inanimate things. So is it with primitive man. Do his hunting expeditions end in repeated failure? Some person, stronger than he but like him, bears him malice. Is a tree struck by lightning? Someone has thrown his battle-axe at it. Do the storms rage and does the earth tremble beneath his feet? Some mighty hand is behind it all. So then primitive man, in measure like a little child, comes to regard, by some process of empathy, inanimate things and unseen agencies as beings like himself.

Now it seems a far cry from this Euetheia period to that of the Olympic gods, but, after all, the process is a natural one. The anthropomorphism, which made Zeus and Apollo and Athena so

[1] Four Stages of Greek Religion, Cf. P. 32.

concretely real, so lucid in shape, and which gave to them detailed personal histories, was a natural development of the early period just mentioned. In the more primitive stage, as Murray points out, certain animals, because most probably of their peculiar or possibly very valuable qualities, were early held as divine. But, as the development went on, the worship of animals gave place to the worship of the Olympic gods. The transition between the two stages was, no doubt, assisted by that custom, which research has shown to exist among many primitive tribes, of a man's wearing the head or skin of a holy beast. "The Mana of the slain beast is in his hide and head and blood and fur and the man who wants to be in thorough contact with the divinity gets inside the skin and wraps himself deep in it." [1] Here is the original medicine-man, soon looked upon as in part at least divine; but, as Dr. Frazer has suggested, some medicine-men have their failures. The people begin to see that he makes mistakes and then, naturally enough, they make the inference that he is not a god but rather a representative only. The real god lives far away on some inaccessible mountain, or possibly in the sky. And so the transition, which likely required generations of human thought and action, is ultimately made. In Greece, the way was, no doubt, thus prepared for the second great stage in its religious development, the stage which Murray has called the Olympian Conquest.

The Homeric poems, whether the work of one writer or more, are the outcome of long processes of growth. True, they transcend in many ways the primitive religion of the earlier period, but they were, nevertheless, much influenced thereby. The multiplicity of myths and the crowd of deities which resulted proved at last, however, a weariness to the developing Greek. "Legends clustered like weeds in a pathless and primaeval forest, obstructed by ever-fresh undergrowth. The thinning axe was wanted, and a hand was presently found to wield it with thew and sinew." [2] Hesiod, a man whose intellect, though clear, was clumsy, attempted this task. He made a brave but unsuccessful attempt to bring order into the chaos, endeavouring to revive many of the dimly-understood traditions extant among the Greeks of his day. The final

[1] Four Stages of Greek Religion, P. 38.
[2] Gomperz, Greek Thinkers, Vol. I, P. 38.

result was that the Olympian gods, shorn of some of their luxuriance, remained to Athens and the mainland of Greece the objects of worship and the centre of religion.

Before this brief survey of the religious background to philosophical speculation is closed, mention must be made of one further important characteristic of this aspect of early history. In the introduction to his classic work on "Greek Thinkers", Gomperz, referring to the gods of Homer, says, "There was a single peremptory exception to the chaos induced by the acts and passions of the Immortals. Moira or Fate was supreme over gods and man alike, and in its worship we recognize the faint and earliest perception of the operation of law throughout the range of experience." [1] The first part of Cornford's work, "From Religion to Philosophy," is devoted to showing the influence of this conception upon the Greek religion and Greek philosophy. The gods of Homer are not all-powerful. "They are limited by Destiny (Moira), which they did not make and against which they cannot stand." [2] As the fifteenth Iliad goes to prove, the partition of the universe into three territories for Zeus, Poseidon and Hades was made for them not by them. "In three lots are all things divided and each took his appointed domain." [3] Moira, originally meaning "part", so Cornford claims, became generalized into the conception Destiny, a conception based, no doubt, upon an, as yet, dimly perceived, regular sequence, which, to the Greek mind, stood for that which was believed to be behind and superior to all the Olympian gods.

It was in a religious environment such as this, then, that Thales, called the first philosopher, lived. It is unreasonable to suppose that he did not share some of the religious beliefs of his fellows. There is nothing in the fragments, which refer to him, to show that he initiated a reformation along religious lines such as Xenophanes, a few decades later, attempted. If Thales did not accept *in toto* the religion of his day, he deviated very little therefrom. His attention was directed, mainly, however, upon the world about him rather than upon Olympus and its mythical inhabitants. He had separated out from the many interests of

[1] Gomperz, Greek Thinkers, Vol. I, P. 29.
[2] Op. Cit. P. 12.
[3] 15th Il. l. 189.

life one special interest. This was as has been stated, what is nature, what is φυσις. The process of the differentiation of the many facts of life into different compartments,—a process, which has enabled man to advance successfully into the territory of knowledge, a process, which until the time of Thales, had been but little employed, was now brought more completely into use, and though, as is to be expected, at first, too little differentiation was made and too much attempted at once, yet the principle was at work, and the advance had commenced. It is altogether too premature as yet in our survey of the history to attempt to analyse out any special characteristics of philosophy, but, as in its simplest and least complex form, the essential features of a flower are depicted, so it will be found that in this early philosophy, as it has been called, there are exhibited the characteristics which are sought.

The influence of the religious atmosphere, noted above, is to be seen not only upon Thales but also upon all the early Greek thinkers. The solutions which they advanced as to what constitutes nature differed much. Various problems arose and these were dealt with in different ways, but never could the influence of the history, which lay back of these investigations, be entirely annulled. Upon Heracleitus, the Pythagoreans, Parmenides, Empedocles, in part, and Plato this influence is especially apparent. The effect upon the Milesians, Empedocles and Anaxagoras and the Atomists,—Leucippus and Democritus, can also be seen, but here the result was of a different nature. The first class of thinkers was influenced more by the mythical and mystical in that religious background. For them, the "needs of the heart" dominate over the "needs of the intellect", so that every problem is for them ultimately an ethical or religious one. The second class was influenced more by the conception of Moira or Fate, as held in the religious background. To them the "needs of the intellect" were paramount, and the men in this latter class were to become representatives of the special scientists of the day.

A brief examination will indicate the nature of this religious influence upon the Greek thinkers, and, first of all, we may consider the mystical tendency or mystical tradition, as it has been called. Interpreters have given many opinions concerning the work of Heracleitus. By some, he has been considered as one of

the later Ionians, by others, as among the Eleatics and still again by another school of interpretation, as belonging, in thought, to neither but as completing and synthesizing the good in each. That he is definitely mystic in his sayings is recognized by all. The fragments of his writings portray him as having an exalted contempt for other writers. He is especially vehement against those who learn many things.[1] He who runs round about, like Hekataeus, picking up scraps of information will not attain the truth. There is one Logos and one Cosmos which is the same for all.[2] His contempt for the mass of mankind led him, like many a mystic before and after his time, to a lone and solitary life.

The Pythagoreans inherited this same mystic temperament, but with the difference that they became disciples and apostles. Men and women needed enlightenment, and, instead of holding themselves aloof, as Heracleitus had done, they began teaching. Like the prophet, Buddha, they were not content to rest under the Bo-tree of self-contemplation and self-satisfaction, but, renouncing that temptation, they set about promulgating the beliefs which were theirs.

Little is known of Pythagoras himself, but somewhat more information is procurable in regard to his followers. Their work centres around two main points,—their views on transmigration and their interest in mathematical studies. The first of these illustrates well the influence upon them of the mystical in the religious background. The belief in the transmigration of souls was no doubt an inheritance from Orphism, which, again, traced its origin back to the worship of Dionysus, the chief Mystery-God of the Greek people. The teaching of this school—one is almost justified in saying, of this religious sect—is predominantly religious; and their speculations, accordingly, show the influence of the mystical ideas which had been handed down to them. Instead of holding that water or the boundless or air or fire is primal, they held that number is the ultimate in the universe. According to Aristotle,[3] the number, ten, was thought by them to be perfect. This, when arranged as different tetractyes, became the "master-key to the

[1] Bywater's Edn. Cf. Fr. 16. (Ritter & Preller's Edn. Cf. Fr. 31).
[2] Byw. Fr. 20. (R. & P. Fr. 35).
[3] Met. I, V, 986 a.

interpretation of the world".[1] The mathematical investigations of this school will be later considered. These latter were also very important, but Pythagoreanism cannot be adequately understood unless the influence upon it of religious mysticism be fully recognized.

This influence is likewise to be seen in a marked degree upon Xenophanes, born c. 569 B.C., and Parmenides, supposedly his pupil, who were the outstanding members of the so-called Eleatic school. The first named was a wandering rhapsodist, who laboured hard to show the logical fallacy of polytheism. With his theological views he held, no doubt, philosophical conceptions much similar to those of his younger contemporary, Parmenides. Parmenides was the author of an allegorical poem, entitled περι φυσεως. This poem is divided into two parts, the first of which treats of Truth and Knowledge, the second of Appearance and Opinion. The form in which his teaching is couched reminds one forcibly of the mystical legends of an earlier date. He represents himself as being brought to the Goddess of Wisdom in a fast-travelling chariot, the steeds of which are driven by the daughters of the Sun. There, at the seat of the Goddess, he learns the way of truth and sees the folly of the undiscerning crowds, "deaf and dumb and blind and stupid" in their opinions. Not only is the mystical element apparent in the form of Parmenides' writings but also in their content. He is concerned to emphasize that what is, is, and that it is impossible for it not to be. Yet, he nowhere tells us clearly just what the connotation of "it" is. He tells us that it "is uncreated and indestructible; for it is complete, immovable and without end. Nor was it ever, nor will it be; for now it is all at once a continuous one".[2] Plato tells us that Parmenides held that "all things were one and that the one remains at rest in itself having no place in which to move".[3] On the supposition that Parmenides was endeavouring, mainly, to deny the existence of empty space his teaching has been summarized by Burnet, in the following words:—"What is, is a finite, spherical, motionless, corporeal plenum, and there is nothing beyond it. The appearances of multiplicity and motion, empty space and

[1] Cornford, From Religion to Philosophy, P. 205.
[2] Diels Edn., Fr. 8. Cf. Burnet Op. Cit. P. 199.
[3] Theaetetus 180 e 3.

time, are illusions."[1] Whether one agrees with this opinion of Burnet or not, it is quite evident that Parmenides had before him a very definite problem and that, in trying to solve it, he emphasized the unity of things. He looked upon Nature and saw it in continuous change; that which to-day is, tomorrow is not. The influence of sun and wind and rain the very hills and mountains seem unable to withstand. Everywhere, change seems to reign supreme. Heracleitus, the lone and solitary Ephesian, had been content to recognize this flux of all things and to find in it the key to the world, but Parmenides seemed to feel such a conclusion quite unsatisfactory. There must be something that abides. That which is, *το ὀν*, that, certainly, escapes this flux and change; that which is fleeting, in relation to the permanent and abiding he calls *μη ὀν*.

Such was the attempt, which Parmenides made to understand the world. With those who were less consistent than he, he had little patience. With breathless energy he struck at the popular view of the world, and against men like Heracleitus, who taught that change is the constitution of all things, he hurled his fiery invectives. For Parmenides, the choice was between change and rest, the many and the one and, having faced the dilemma, he fearlessly and with unfaltering courage took his stand upon the one.

The assumption of the illusoriness of the world about us is however one with which man has never been satisfied, and, in the development of Greek philosophy. Parmenides and the Eleatic school were to be followed by Empedocles. Though there are many inconsistencies in the written records of this man, yet it is quite evident that he shared little of the suspicion which Parmenides held for the world of sense. Empedocles, despite his charlatan spirit and pompous manner, succeeded in making no small contribution to the history of physiology, chemistry and physics; but the point with which we are here interested is the fact that he, too, shows unmistakable traces of religious mysticism. Empedocles devoted a whole poem, called the book of "Purifications", to describing the means whereby the imprisoned soul might regain its heavenly home. He appeared, as Gomperz has said, "at one

[1] Op. Cit. P. 208.

and the same time as an orthodox member of the Orphic community filled with pious faith, and as an eager champion of scientific natural research, as the heir of venerable mystics and priests, and as the immediate precursor of the atomic physicists".[1]

But if the influence of religious ideas and mystical conceptions may be seen upon these early thinkers, much more is it to be traced in the philosophy of Plato. So much so is this the case that Wundt has been able to say, "Religious and ethical problems are not for him intellectual problems but on the contrary almost every single question of knowledge becomes for him an ethical and religious problem".[2] Throughout the Platonic dialogues the influence of mysticism is exhibited. It seems almost to be the warp and the woof of his philosophy. He was a religious poet, who, like his predecessors, faced the problems of the universe and tried to solve them, but the ethical and religious interests dominated all his thinking. It is only necessary to recall, as an example of his mystic tendencies, the familiar doctrine of Reminiscence, which occupies a prominent place in at least three of the dialogues—the Phaedrus, Meno and Phaedo. For Plato, all education was a process of purification, a gradual recovery of what at birth man had lost, an ever more perfect reminiscence of the upper world. From this point of view, therefore, this mundane existence and the human body are the soul's sad prison-house, and it is the hope of the soul to escape from its bondage and return again to its own abode.

The mystical religious tendency, which plays such a role in certain aspects of Plato's thought, was one of the characteristics of subsequent speculation, and has never, indeed, been without an advocate wherever speculation has operated relative to the religious aspects of human life. Here it is necessary to leave this mystical tendency, as Cornford has called it, in order to follow the scientific tendency, which also was developing among the Greeks. But it must not be supposed that with Plato the influence of religious mysticism upon philosophy ceased. Rather, its effect may be traced in, if not a more sublime and beautiful form, possibly in an even more pronounced way upon many a succeeding thinker. So marked has this attitude been throughout the centuries that

[1] Greek Thinkers, Vol. I, P. 252.
[2] System der Philosophie, P. 5.

the late Professor James [1] could divide philosophy into two schools, the one he called, in figurative language, the "tender-minded",—these are the mystics,—the other he called the "tough-minded". It is upon the early members of this latter class that attention must now be centred.

Anaximander, born 610 B.C., the second head of the Milesian school, is its most important member. Gomperz even says of him that "we may fairly look on Anaximander as the author of the natural philosophy of Greece and consequently of the Occident. He was the first to introduce the scientific method in answering the vast questions as to the origin of the universe, the earth and its inhabitants. . . . Childish as some of his endeavours were to grope out the way of nature, yet his merits as a pioneer and a path-finder command our awe and respect".[2] Anaximander was the first to give to the Greeks a map of the earth and a chart of the sky. He endeavoured to arrive at the magnitude of the sun and of the moon relatively to that of the earth, and, though his accounts are hardly intelligible to us to-day, yet he must be accorded a certain degree of mathematical training. His attempts to explain the origin of the heavenly bodies, based on the opposites hot and cold, are no less ingenious than his speculations on the evolution of an mals. It is no doubt going too far to call him a precursor of Darwin, but the records which we have unmistakably point to him as one who avoided mere speculation. He must have been a careful observant of facts of nature. In his cosmological inquiries Anaximander is far ahead of his predecessor, Thales. The latter had said that water is the original element of all things, Anaximander claimed that it was neither water nor air nor fire. The pr mary substance was το ἀπείρον, the Boundless, as it has been translated. He seems to have realized the futility of attempting to explain the variety of nature by any one part of nature, and so postulated the Boundless which was other than the four elements. From this Boundless, as Aristotle says in his Physics, the "elements"[3] were believed by Anaximander to have arisen, separated out by the "eternal motion". These "elements" are limited, are grouped in pairs of opposites and are the "secondary stuffs", to

[1] Pragmatism, P. 12.
[2] Op. Cit. Vol. I, P. 49.
[3] As Burnet points out, this is certainly an anachronism, as the conception of "elements" dates only from the time of Empedocles. Cf. Burnet Op. Cit. P. 56.

quote Cornford, "out of which individual things were born and into which they are resolved again".[1]

If one turns from Anaximander to Empedocles, he sees the same attitude of mind exhibited which marked the Milesian philosopher. Though, as has been already shown, Empedocles was influenced considerably by mystical conceptions yet he likewise carried on that observation of facts, which Heracleitus so much despised and Anaximander, apparently, found so advantageous. Empedocles attempted to explain everything by the four elements, which, under the influence of "Love" and "Strife", formed themselves into different proportions, thus producing the various things of nature. Besides these cosmological inquiries Empedocles was greatly interested in what we to-day would call physiological, psychological and chemical pursuits, while Aristotle called him the inventor of rhetoric, and Galen made him the founder of a school of medicine. The line of development, which is here being traced, leads, however, especially to his work in cosmology. He saw that it needed at least four elements or constituents to account for the multiplicity of things. These roots were eternally distinct from each other. Anaxagoras, his contemporary, however, found it difficult to agree that hair could come from not hair,[2] and so claimed that "all things were together infinite both in number and in smallness; for the small too was infinite, and, when all things were together, none of them could be distinguished for their smallness".[3] The homoiomeries of Anaxagoras, as they are called, were then qualitatively different. The smallest portion of anything is still that thing. Instead of Love and Strife, Anaxagoras substituted what he called Nous to account for motion. But, just as the Love and Strife of Empedocles were considered spacial,[4] so with Nous. It cannot be called spiritual neither material. To use such terms at this period is to be guilty of an anachronism. Nous is the thinnest of all things, it occupies space, for there are greater and smaller parts of it.[5] Upon these speculations, which, as can be readily seen, were far more in accord with the facts than the theories advanced by such as Heracleitus and Parmenides, Leucippus and Democritus built up their system. The only frag-

[1] Op. Cit. P. 8.
[2] Diel's Edn. Cf. fr. 10.
[3] Fr. I.
[4] Cf. fr. 17.
[5] Cf. fr. 12.

ment of Leucippus, which has survived, states that "Nothing happens for nothing, but everything from a ground and of necessity". Aristotle complains that these men, indolently, left the source of motion unexplained. Unlike Empedocles and Anaxagoras, they simply assumed that motion is eternal. Theophrastos tells us that Leucippus believed that there were "innumerable and ever-moving elements namely, the atoms, and he made their form infinite in number since there was no reason why they should be of one kind rather than another. . . . He held further that what is, is no more real than what is not, and that both are alike causes of the things that come into being".[1] Atoms and the void, including motion, are then equally real and explain all things. Different qualities are explained by the variations in the number, size and shape of the atoms, for, unlike the homoiomeries of Anaxagoras, all the atoms are qualitatively the same. Though the atomic theory, which has played such an important part in the development of modern chemistry, differs from these early attempts in several important points, yet, peculiarly enough, modern science is coming once again to believe in the fewness of the chemical elements, and it is quite possible that the Democritean ideal of only one kind of element may yet be realized. That such a discovery will enable men to explain all the facts of life by one elemental substance, in no sense, follows. No more can they be explained by seventy elements. That, however, is a question with which we shall be concerned in a later part of this thesis.

In these early atomists, then, there is the culmination of this scientific tendency among the Greeks. It is true that the Epicureans made some slight additions to the atomism of Democritus, but the chief work was done by the earlier thinkers. Now, in this aspect of Greek philosophy, is there to be found any trace of that religious background which has been already sketched? That religious interests not only influenced but, in the main, dominated that other trend of thought, the mystical tendency, it was easy enough to show, but, here, circumstances are much different, and yet even this scientific tendency owes much to the earlier religious ideas of the Greek people.

It will be remembered that the gods of Homer were subordinate to Destiny or Moira, that, according to the Olympian theology, Moira had allocated to the three brothers, Zeus, Poseidon and

[1] Phys. Op. fr. 8.

Hades their respective domains. For this principle of Destiny the mystical school cared nothing; behind their philosophy were the troubled forms of Orpheus and Dionysus. Behind the work of Anaximander and the atomists, however, was the Homeric theology, polytheistic and anthropomorphic, but holding to the fatalistic rule of Moira. In his work, "From Religion to Philosophy", Cornford sums up in the following paragraph this influence upon what he calls the Ionian Science. The scientific tendency in Greek philosophy and the Olympian theology "are two similar products of the same temperament. Both systems of thought are governed by the notion of Moira,—the distribution of the world into spatial provinces. Both are pluralistic, rationalistic, and fatalistic in tendency. Above all both are realistic, in the sense that is opposed to other-worldliness. Science, no matter to what heights of disinterestedness its specific emotion of curiosity may sometimes rise, remains practical from first to last, and for it all value lies in the sense-world. True it will mistake its own conceptual model of atoms and void for the real structure of the universe, and condemn the senses because we cannot see and touch the supersensible. But its affections are never set upon the metaphysical construction; the spectral dance of imaginary, dead particles has never smitten the human soul with homesickness. The intellect must find its satisfaction in the excitement of pursuit, not in the contemplative fruition of anything it can either discover or invent".[1] Perhaps the strongest single statement which remains, that shows the influence of this conception of Moira, is that of Leucippus already quoted,—"Nothing happens for nothing but everything from a ground and of necessity."

It would appear, then, to be a superficial reading of the history of philosophy which sees in these men no influence of the religious conceptions which they had inherited. Just as in a later age the same religious idea took hold of the minds of certain men and made them Predestinarians, so, here, in this tendency, there is exhibited the same principle. If we call the mystical school in Greek philosophy, Arminians, then the Milesians and the Atomists are the Calvinists of their day, but it must be remembered that to the Greeks Moira signified not a god with foreknowledge but rather what, to-day, might be called the interdependence of facts. It was Law, supreme alike over nature, men and gods.

[1] Op. Cit. P. 143.

## CHAPTER II.

### Early Science-Philosophy.

The preceding chapter has traced that development of thought which characterized part of the early Greek philosophy, following its course, as it has pursued two main channels, until there have been introduced the work of Plato on the one hand, and that of the Atomists on the other. Each of these branches of Greek thought shows in its own way unmistakable effects of the fountain-head of religion, whence they both derive their origin. But attention has been given, almost entirely, to the cosmological aspect of the development. In the earlier writers, it is true that that constituted, practically, their only inquiry, but, with Plato, the facts are much different. Back of Plato was the work of Socrates and behind Socrates the Sophistic movement, and before the Greek period is completed it will be necessary to devote some time to a presentation of the trend of thought which culminated in Plato and Aristotle in order to discover the specific nature of philosophy, and in order also to trace the effects of their conclusions upon subsequent history. But before that task is entered upon, it will be well to delineate certain developments of a special character, which originated outside the Greek nation, many of which, indeed, occurred long before the dawn of Grecian history.

In the outline of the second of those philosophic streams, which flowed from the Greek religion—the scientific, as it has been termed—notice has already been made of certain eddies in the main current, which finally assumed strength enough to break the banks of the channel and to start out as little rivulets, gradually to develop into special sciences. The astronomical endeavours of Anaximander, the physiological work of Empedocles are examples of this tendency. Not only was this evidenced in the scientific class, but, even among the mystic Pythagoreans, there developed a genuine interest for mathematics, which resulted in no small contribution to that branch of knowledge.

But it would be a great mistake to suppose that the Greeks were the first to devote themselves to these studies. Sir Henry

Sumner Maine has said, "Except the blind forces of Nature, nothing moves in this world which is not Greek in its origin," but such a statement, even if it were intended so, cannot be accepted literally. To the Greeks the Western world owes a debt it can never pay, but the study of the origins of the different sciences serves to show that other peoples than they had something to do in helping mankind take its first wavering steps on the road of knowledge.

Man's antiquity is measured not in centuries but in millenia, and the beginnings of science are lost in dim and distant ages, but, nevertheless, there is no doubt that long centuries had passed before man had obtained a firm enough hold in the struggle for existence to be able to consider reflectively the facts of his life. Unfortunately for the historian, many more centuries passed by, before records were made and preserved, and to-day, he who would understand the origin and early beginnings of science has before him a very difficult, though intensely interesting, task. The task is difficult, not only because of the paucity of the records that remain, for we must believe that comparatively few have survived the destructive acts of fire and flood, of monarchs and mobs, but even more particularly because it is well-nigh impossible for us to divest ourselves, in imagination, of our present knowledge, and to place ourselves in the position of the early pioneers of science. And yet, if this be not done, the early ventures of the race can neither be understood nor appreciated. When modern science forgets or neglects the history through which it has come, it is untrue to its own principles and in danger, too, of misunderstanding its own significance.

Though many of the scientific pursuits, which engage men's thought, can trace a long and ancient history, yet few, if any, can lay claim to as early a beginning as the science, which, to-day, is known as astronomy. Primitive man was compelled to accommodate his acts to attacks of disease, to the fortunes of war, and to the irregular changes of weather, but not less was he forced to attend to the alternations of light and darkness, and of heat and cold, and one of his earliest conclusions would, no doubt, be that the sun was in some way connected with these varying phenomena. This led to a search for other signs in the heaven,

and if the appearance of an unusual phenomenon in the sky, say, of an eclipse, was associated with any particular terrestrial event, for example, the death of some chief or some scourge of plague or famine, the coincidence, as we would call it, would certainly impress him very greatly. Thus it came about that men of remote ages observed and recorded the occurrences of comets, eclipses, meteor-showers and like phenomena. Not only were these facts observed, but suggestions were made to explain the facts. The earth was early looked upon as a circular plane, surrounded and bounded by the solid hemispherical vault of the heaven. The stars seemed to be fixed in this vault, the moon and, later, the planets were supposed to crawl over it. That the sun also was supported in the sphere of heaven and, like moon and planets, made his way across it, the ancients hesitated, for long, to say. No doubt the difficulty which they felt in making this supposition was due to the fact that in the day-time the stars were no longer visible. Another problem, which faced them, after they had placed the sun in the vault of heaven, was how to explain that the sun, having set in the West, should rise again in the East. Was it the same sun or a different sun? From such practical conditions, and out of such perplexing difficulties as these just mentioned, the science of astronomy began slowly to evolve.

It is impossible to fix, with any certainty, the dates or the names of the persons associated with that systematic observation of the moon and the planets, which resulted in the discovery of their regular motion among the stars. The grouping of the stars into constellations, and the prediction of solar and lunar eclipses were evidently accomplished at a later date in the history of the science, but, notwithstanding, long years before history, properly speaking, begins. As Professor Forbes, in his excellent little work, "History of Astronomy", has surmised, it is, no doubt, quite probable that the discoveries mentioned above were made independently by Chinese, Indian, Persian, Tartar, Egyptian, Babylonian, Assyrian, Phoenician and Greek astronomers. The science of astronomy can certainly trace its origins to a remote antiquity. For this reason, and also because of the questionable trustworthiness of some of the traditionary records, which have come down to historians, it becomes a difficult task to assign to particular nations

their respective places in the development which has taken place.

The character of knowledge in regard to the Chinese contributions to astronomy is most unsatisfactory and has frequently given occasion to much discussion and various views, but, after making considerable discount, the most conservative historians seem agreed that very early indeed the Chinese, noted always for their patient and painstaking habit of thought,—a disposition, most admirably suited for astronomical observations,—had made considerable progress in this science. The first dates, it would seem, go back almost as far as 2952 B.C., shortly after which time Yu-Chi made a sphere to represent the motions of the celestial bodies. In the twenty-fourth century B.C. the Emperor Yao gave orders that the position of the sun at the time of the equinoxes and solstices should be determined. The positions were recorded by giving the names of the stars occupying the respective places at those seasons. From 2296 B.C. on, there are cometary references and from the year 611 B.C. these are quite trustworthy, while it is reported in a collection of documents called the Shu Chung, a collection already antique in the time of Confucius, that certain royal astronomers, Hi and Ho, failed, in the year 2159 B.C., to predict an eclipse,—a failure, the penalty of which they paid with their lives. It is claimed by some that, as far back as the year 2357 B.C., the Chinese knew that the year, itself determined, doubtless, by the recurrence of the seasons, had $365\frac{1}{4}$ days, and one document even holds that a year of 365 days was adopted with an intercalary day every four years. Whether this be true or not, it is evident that great credit is due to the Chinese people, who, in very early times, carried on such important investigations.

Egyptian and Chaldean astronomy also lay claim to high antiquity. Here, and indeed, most probably in China also, astrolatry preceded astronomy The stars, as well as the sun and the moon, impressed the imaginative minds of these early peoples, and frequently elicited response from them in the form of worship. There has been much speculation as to the astronomical meaning of the Great Pyramid, but most of it has been unsatisfactory and inconclusive. What knowledge was obtained by the observations made was closely guarded by the priests, who spent most of their time engaged in the arts of divination and astrology. Similarly

the Chaldeans, among the Babylonians, made many observations of the varying aspects of the sky, and records, dating from the reign of Sardon of Akkad, 3800 B.C., show, thus early, star groups had been formed, and that the zodiac,—a word which, etymologically, suggestively enough means live things,—had been determined.

When one turns from these investigations to those with a similar content, which were carried on in Greece, he does not find, as some would claim, an entirely new attitude among the investigators. In the earlier nations, observation was most careful and painstaking, facts were collected and classified, while conclusions, in the form of different theories, were in many cases very well drawn, and the Greeks followed this same method. The development was quite normal. There was no great intellectual revolution. The time has gone by when men look back upon the Greeks as the pioneers of all art, literature and science. Recent excavations and researches have enabled men to see that the Greeks, in the main, continued and developed what had already been commenced by older nations; to have done so, and to have accomplished that task so successfully was a great achievement, but it is a mistake to attribute to the Greeks the origination of all art and science. In astronomy, perhaps more than in other sciences, they borrowed much from other peoples. The information, which we have about the earliest Greek astronomer, is derived from Herodotus, b. 480 B.C. Thales had, according to the tradition registered by Herodotus, visited Egypt, and in the opinion of Gomperz, had probably familiarized himself in Sardis with the elements of Babylonian wisdom, from which he learned something, no doubt, of the periodicity of eclipses. The tradition, which ascribes to him the foretelling of an eclipse of the sun in May 585 B.C. is at any rate fairly well-accredited. Other reports say that he learned from the Egyptians the length of the year, the signs of the Zodiac, and the position of the solstices. Passing over Anaximander, who made some attempts to estimate the size of the sun and moon relatively to the earth, one comes next to the school of Pythagoras. The founder of the school had himself visited Egypt, but how much of the speculations of Pythagoras and his followers is due to Egyptian influence, it is impossible to tell. The earlier astronomical speculations of the school, important among which was that of the

counter-earth, possibly invented to explain the eclipses of the moon, and that of Olympus, as a source of light, were soon discredited and gave way to a much more important and interesting theory. Ecphantus, one of the youngest of the Pythagoreans, held that the earth turned of itself in a definite direction (that is, turned upon its axis), and for this reason Copernicus, in the sixteenth century, was able to claim that his system was not a new one but was a revival of the theory held by the Pythagoreans. The marked difference in the luminosities of the different planets, and the differences, indeed, in the intensity of one planet at different times soon suggested that these were at different distances from the earth, and so a blow was given to the ancient notion of the one dome of heaven supporting the heavenly bodies all at a fixed distance from the earth.

Eudoxus of Cnidus, 370 B.C., unable to tear himself away entirely from the notion of the spherical vault of heaven, but seeing the insufficiency of the theory of one dome, postulated one for each separate motion, but the increasing number of vaults was becoming unintelligible, and a hundred years later Aristarchus of Samos, having learned from Eudoxus that the sun was considerably larger than the earth, was able to advance a new theory which had none of the intricacies and complexities and absurdities of the old supposition; the earth had to lay down its sceptre, geocentricity was superseded by heliocentricity and Aristarchus became the Copernicus of antiquity. But the new theory was not to be accorded a hearty welcome, for Hipparchus, the next astronomer of note, went back to the geocentric view. Notwithstanding this, Hipparchus holds an important place in the pages of the history of astronomy, because he assisted materially in coordinating that science with the mathematics of his day. He was able to compute the length of the year differing by only four minutes from present day calculation; he observed and made a catalogue of 1080 stars, dividing them into six classes of brightness or magnitude, a work which is one of the finest monuments of ancient astronomy. Because he supposed the earth to be fixed, he found it necessary to assume that the centre, around which the sun revolved, was a point a little distance from the earth, which point he called the eccentric. Ptolemy, writing 250 years later, expounded the work of Hipparchus, adopting his

geocentric system. To explain the apparent retrograde motion of the planets, Ptolemy not only adopted the eccentrics of Hipparchus but assumed also epicycles for each planet and thus was formed the cumbrous theory which is known to history as the Ptolemaic system. Without a doubt these eccentrics and epicycles are the responses of the astronomers to the demand made by Plato for uniform circular motion,—an excellent example, as can now be seen, of an unfortunate influence by a philosophic system upon a special science.

To continue tracing the development of this science is here unnecessary, suffice it to say that the dictatorship of Ptolemy in astronomy remained till with the work of the great Kepler, building upon the achievements of Copernicus and the accurate observations of Tycho Brahe, a new and simpler theory was devised, a theory which treated the earth and planets as moving in ellipses with the sun occupying a non-central position.

Before the nature of science can be properly understood, it will be advisable to give a brief outline of the development of early mathematics and mechanics, other of the special sciences which have had a long and interesting history. After that is completed, it will then be possible to look back over the development which has taken place and to ask what science actually is. Then, in the following chapter, the philosophic thread may again be taken up with the aim of forming some proper conception of the nature of philosophy.

That mathematics did not originate in Greece is evident, not only from the testimony of the Greek writers themselves, but also from the documentary evidence which recent scholarship has been able to produce. In Plato's Phaedrus, Socrates is made to say that the Egyptian god Theuth first invented arithmetic, geometry and astronomy, and Aristotle, Meta. I i, tells us that geometry was originally invented in Egypt. Eudemus declares that Thales studied there, while Diodorus and Strabo at later dates both record the tradition that geometry and astronomy are the inventions of the Egyptian priests who claimed Pythagoras, Plato, Democritus, Eudoxus and others as their pupils. But the most interesting statement which bears upon the relation of Grecian and Egyptian mathematics is that found in Herodotus, II ch. 109. The passage reads as follows: "They said also that this king (Sesostris or

Ramses II, c. 1400 B.C.) divided the land among all Egyptians so as to give each one a quadrangle of equal size and to draw from each his revenues by imposing a tax to be levied yearly. But every one, from whose part the river tore away anything, had to go to him and notify what had happened; he then sent the overseers, who had to measure out by how much the land had become smaller, in order that the owner might pay on what was left in proportion to the entire tax imposed. In this way, it appears to me, geometry originated which passed thence to Hellas." Whether this theory of the origin of geometry be entirely correct or not, it most probably contains at least the germ of a very valuable truth. Geometry, like astronomy, arose because of the practical needs of man, and though in later years practical applications form no necessary part of any science, yet it is doubtless true that all science originated because certain very practical needs in the life of men had to be faced.

When one turns from the Greek traditions to the documentary evidence, one finds himself on more satisfactory ground. The ancient Egyptian papyrus, which is part of the Rhind collection in the British Museum, was deciphered in 1877 and was found to be a mathematical manual containing many problems in arithmetic and geometry. It was written by a priest, Ahmes by name, who lived considerably more than a thousand years before Christ, and the document seems to be founded on an even older work believed by Birch to date back as far as 3400 B.C. The Ahmes Papyrus represents apparently the most advanced attainments of the Egyptians in arithmetic and geometry. Remarkable as it is, that they should have reached so great proficiency at so remote a period of antiquity, it is yet even more strange that during the next two thousand years they should have made so little progress. Perhaps one explanation of this is that the knowledge which they held was carefully guarded by the priests and was entered upon their sacred books. Afterwards, as has been only too often the case, these writings became sealed books and it was considered heretical to augment or modify anything therein. The Book of Ahmes is entitled "Directions for Knowing all Dark Things", and contains a number of very interesting problems. The first part, to use modern language, deals with the reduction of fractions whose

numerators are 2 to a sum of fractions each of whose numerators is 1. Thus $\frac{2}{29}$ is stated to be the sum of $\frac{1}{24}$, $\frac{1}{58}$, $\frac{1}{174}$ and $\frac{1}{232}$. Whether Ahmes has any general rule for this kind of reduction, or whether the solutions given represent the accumulative experience of previous writers, it is hard to determine. Having finished the subject of fractions, Ahmes next proceeds to the solution of problems which are nothing more nor less than equations of one unknown quantity[1]. The problem, in its translation, is generally stated thus, Heap, its $\frac{1}{7}$, its whole, it makes 19, or as it would be put to-day $x+\frac{x}{7}=19$. Ahmes gives the answer as $16+\frac{1}{2}+\frac{1}{8}$, still following the Egyptian custom illustrated above of reducing all fractions to the sum of those whose numerators are 1. Algebra then, in its beginnings, would appear to be as ancient as geometry. The document also devotes itself to attempting to find the areas of isosceles triangles and of isosceles trapezoids. The areas of circles are also found with a very fair approximation to correctness.

It is evident then that mathematics, more especially of a practical kind, had reached a relatively high degree of attainment among the Egyptians at a very early period. But the same appears true, though perhaps in a somewhat less degree of the ancient Babylonians. Two tablets have been discovered and the cuneiform system of writing deciphered. The most interesting information gleaned from the first tablet is that the Babylonians must have used not only the decimal system but also a sexagesimal one. For instance, the tablet contains a table of square numbers up to $60^2$. The square of 7 is given as 49, that of 8 as 1.4, that of 9 as 1.21 and so on. The only intelligible solution for this is that they used the sexagesimal scale. Cantor has suggested that the reason the Babylonians used this system is because they at first reckoned the year at 360 days. The circle was then divided into 360 degrees, each degree being analogous to the amount of the supposed daily movement of the sun around the earth. If it be assumed that they were familiar with the fact that the radius may be applied as a chord to the circumference six times and that each of the resulting chords subtends an arc, measuring exactly 60°, we have a probable basis for their using the sexagesimal system. The

[1] Cf. Cajori, History of Mathematics, P. 15.

second tablet also illustrates this same system. It records the magnitude of the illuminated portion of the moon's disc for every day from new to full moon. The whole disc they assumed to be equal to 240 parts and the result for the first 5 days is, 5, 10, 20, 40, 1.20, which is a geometrical progression. After that, the series becomes an arithmetical progression.

It was not until the seventh century B.C., long years after the development outlined above, that the Greeks became interested in mathematical studies. Very early in their work they seem to have drawn a distinction between what Plato called λογιστικη and ἀριθμητικη. At first this distinction was not made, but it certainly dates from an early period. Plato pronounced calculation, λογιστικη, a vulgar and childish art, but he devoted much time to arithmetic itself. The study of the evoluton of calculation, or the mode of counting, is intensely interesting. Our own system of notation, generally credited in its origin to the Arabs, was borrowed by them from the Hindoos, and was not used by the Arabs themselves till after the time of Mohammed. That this Hindoo system itself did not spring into existence at one time we may be certain, but there is no record as to when it was invented nor as to who was its inventor. The early Greeks, like other primitive peoples, began only gradually to learn to count. They commenced with groups of only two or three things and then later five. Fingers or toes or possibly both were used as a ready means to aid them, and the decimal scale, prevalent very early, was doubtless based on this fact, though, to be sure, a quinary or vigesimal scale might equally well have resulted. Pebbles also were used and in case of large numbers the device became gradually customary to use parallel, vertical lines, one line representing units, another tens, a third hundreds, and so on. Later, frames came into use, string and wires upon these taking the place of the rows of pebbles. This was the origin of the abacus, used so much in early calculation. The Greeks finally used alphabetic numerals but never possessed the boon of a clear, comprehensive symbolism.

In the other branch of the study, ἀριθμητικη, arithmetic, as it has been called, the Greeks were however greatly interested. The Pythagoreans classified numbers into odd and even and knew that the sum of the series of odd numbers from 1 to $2n + 1$ was always

a complete square. They spent much time in studying the different progressions, and devoted their attention also to the subject of proportion, investigating arithmetical, geometrical and harmonic proportions. Eudemus attributed to the Pythagoreans the theory of so-called irrational quantities, and it is quite possible that they had made the discovery that some problems cannot be solved, especially since we are told that Pythagoras made many investigations into geometry and among his studies was that of the right triangle. Without a doubt, such a discovery would appeal strongly to the school which was peculiarly susceptible to the mysterious. Euclid, c. 300 B.C., was well aware of this same difficulty, and in the tenth book he treats of incommensurable quantities at length, but, not until the fifteenth century, was the subject again investigated. The seventh, eighth, and ninth books of his Elements were devoted to arithmetic by Euclid, after whom for nearly four hundred years the theory of numbers remained practically stationary. Geometry had become so important in the eyes of the Greeks that it practically monopolized their time from Euclid on.

It has already been seen that the early Milesians, borrowing from Egypt had made some advance in geometry[1], but with the Pythagoreans geometry was placed upon a much firmer basis. To Pythagoras is ascribed the important theorem that the square on the hypotenuse of a right-angled triangle is equal to the sum of the squares on the other two sides. If the Egyptians had only known this in the special case where the sides are 3, 4, 5, respectively, Pythagoras, in thus generalizing it into a theorem, made a great step in advance. The theorem on the sum of the three angles of a triangle was proved by the Pythagoreans, and they demonstrated that the plane about a point is completely filled by six equilateral triangles, four squares or three regular hexagons, so that it is possible to divide up a plane into any one of these figures. Political and social conditions in most of Greece were at this time ideal for work of this kind. Athens, for example, was after the battle of Salamis, 480 B.C., the centre of commerce and wealth. Slaves performed all the drudgery of life and the citizens of the place were able to devote much time to mathematics and kindred studies. To those men who first made rhetoric a chief study, and went from

[1] Cf. J. Gow, History of Greek Mathematics, chs. 6 and 7.

place to place teaching the many who had freedom and inclination for the work, to the Sophists, or certain of them, geometry owes considerable. Chief among these was Hippocrates of Chios, who was one of the first to make an attempt to solve that well-known problem in mathematics the quadrature of the circle. Because, however, these Sophists were not popular with the rising Platonic school, the early historians have disregarded their work in great measure, and as a result information in regard to them is very meagre.

Plato and his school placed likewise great importance upon geometry, and it is said that over Plato's porch he had inscribed: "Let no one who is unacquainted with geometry enter here." Many of the definitions and some too of the axioms of Euclid are to be ascribed to the Platonic school. Though it is quite true that the main interest of Plato himself was in morals, yet his admiration for geometry was very great. His main contribution to the science however lay in this, that he trained his followers to think logically. He was in mathematics a maker of mathematicians, rather than an originator of discoveries. He emphasized the necessity of careful definitions and distinct statements of postulates and axioms, a method which Euclid afterwards adopted, and here the influence of Socrates upon Plato, an influence which will be more fully exhibited in the next chapter, is to be clearly discerned.

The most brilliant of the mathematical pupils of Plato was Eudoxus, born 408 B.C., who, it is claimed, was the author practically of the whole of Euclid's fifth book, and indeed it is now generally agreed that the substance of nearly all the geometry of Euclid's Elements was known before the time of Euclid, and much of it had already been methodically arranged. Upon Euclid himself there devolved the task of further collecting the material, connecting it where necessary, and, in some cases, enlarging the proofs. Though very little is known of his life, it is certain that Euclid lived and taught in Alexandria some thirty or forty years after the founding of that remarkable city, the city which already had become the meeting place of all the most important trade-routes, and which was destined to become, throughout the next few centuries, in very truth, the melting-pot for the thought of the then-known world. It is hardly necessary to say anything about the nature of the

Elements. The compilation became popular almost immediately in Alexandria, and, for long centuries, formed the basis of all geometry. It is interesting however to note that what are called in our text books axioms were called by Euclid "common notions" and that, though there has been much controversy upon the point, the "common notions" of Euclid, himself, seem to have been not twelve in number but ten. The axioms about right angles and parallels were probably placed by Euclid among the postulates, a class to which they better belong. One postulate, as mathematicians have recently pointed out, the compiler of the Elements certainly overlooked entirely, though he frequently made use of it in his proofs, namely that of superposition, according to which figures can be moved about in space without any alteration in form or magnitude. The work contained in Euclid's Elements had a tremendous influence upon succeeding generations. Geometricians have not been alone in their admiration for the results achieved and the apparent infallibility of the method used, and it is only in comparatively recent times since the writings of Lobatchewsky, 1793-1856, that further developments along the line of a non-Euclidean geometry have detracted somewhat from the interest attaching to this great work. But the mathematics of the Greeks had not yet reached its zenith, for, shortly before the death of Euclid, there was born, most probably of very humble parents, the greatest mathematician of antiquity, as he has been called, Archimedes of Syracuse. The fame of this splendid scholar depends not only upon his achievements in geometry but also upon his attainments in mechanics and arithmetic, and his success in mechanical inventions. These latter Archimedes himself is reported to have belittled. He prized far more highly his discoveries in what some would call pure science, and those which were by him considered most valuable are contained in his "Sphere and Cylinder". "In it are proved the new theorems, that the surface of a sphere is equal to four times a great circle; that the surface of a segment of a sphere is equal to a circle whose radius is the straight line drawn from the vertex of the segment to the circumference of its basal circle; that the volume and the surface of a sphere are two-thirds of the volume and surface respectively of the cylinder circumscribed about the sphere. Archimedes desired that the figure to the last proposition be inscribed on his

tomb. This was ordered done by Marcellus."[1] As Cajori points out the most wonderful of his works is, perhaps, his treatise "On Spirals". He was deprived of the use of the infinitesimal calculus, but this only served to display the fertility of his genius. In its stead, he used in a masterly manner the so-called "method of exhaustion". The geometry of the Greeks had reached a high degree of attainment, and though Archimedes was to be followed by other great scholars such as Apollonius of Perga, Hipparchus, Ptolemy and Pappus, yet, geometry, as a science, was already established and well-differentiated.

But there was another study, which engaged the fertile brain of this master mathematician, and that is the science we call mechanics. In this particular realm, Archimedes had far fewer predecessors than in geometry. And yet it is true that ancient Egyptian and Assyrian monuments contain pictorial representations of many kinds of implements and mechanical devices. Very early in his history, man was able to fashion crude implements, and, in the excavations which have been made, many interesting discoveries have resulted, discoveries which have enabled anthropologists materially in constructing a theory of the development of primitive man. The lever, the inclined plane and the wedge were known from a remote antiquity, and their practical use takes us back to the dawn of history. But apparently little effort was made to understand the principles of these instruments until many centuries after their invention. Indeed, it was not till the time of Archimedes that mechanical science became, in any sense, properly formulated. Archytas, of the school of Pythagoras, is said to have invented the screw and the pulley, and Aristotle, in his Mechanica Problemata, c. 18, describes in a rather vague way a compound pulley. It is evident, from the same work, that, before Archimedes, the mathematical theory of the lever was under consideration. Some conception of the parallelogram of forces had also appeared and, it is possible, since Archimedes uses the concept "centre of gravity", without defining it, that it was already in use. His investigations into mechanics, contained in his "Equiponderance of Planes", and his book, "On Floating Bodies", are fashioned somewhat after the method which Euclid had used so successfully. Book 1 of the latter

[1] F. Cajori, A History of Mathematics, P. 42.

treatise begins with two propositions to the effect that the surface of every still fluid is spherical, the centre of the sphere being the centre of the earth. This book contains in all nine propositions. In the second book, he deals mainly with the question of specific gravity, a question to which his interest was aroused, so tradition says, by the request of the perplexed King Hiero, who wished to know whether or not his crown was alloyed with silver or other metal.

In his Equiponderance of Planes, Archimedes commences by making certain assumptions, which he, no doubt, regarded as self-evident, and which would be called to-day axioms. By means of these, he proves the law of the lever, which according to Mach[1] he stated as follows:—"Commensurable magnitudes are in equilibrium when they are inversely proportional to their distances (from the point of support)." Now one of the axioms which he assumed, and did not therefore attempt to prove, was "magnitudes of equal weight acting at equal distances (from their point of support) are in equilibrium". It is natural for one to ask why both the axiom and the proposition (the law of the lever stated above) might not have been proved directly by experiment, and then both placed on the same level. But the important point is that Archimedes tried to explain the lever in terms of phenomena which he, at any rate, regarded as simpler and better known. That was a great insight, and, as shall be seen, is the type of all scientific explanations. Very little advance upon the results of Archimedes in mechanics was made till centuries later, when that great polymath Leonardo Da Vinci, 1452-1519, shaking off the traditions of Aristotle, continued the investigations begun in this earlier period, investigations which were shortly followed by those of Stevin and the illustrious achievements of Galilei and Newton who prepared the way for the modern development of this science.

Before concluding this chapter, it will be well to ascertain, if possible, from the material presented what science is. It will be remembered, that, just as it was considered inadvisable to commence the discussion of philosophy with a preconceived definition of philosophy, so in the outline of the development of science, it was deemed inadvisable to begin with any arbitrary definition. But now, after history has presented the accounts of the different

[1] E. Mach, Science of Mechanics P. 9.

sciences in their early beginnings, one can make use of this material to discover a definition of science. The anthropologist, who desires a definition of the word man, does not accept any definition which is suggested, and then make his classification accordingly. The physicist does not define electricity or æther in any haphazard way, neither does the political economist nor the student of morals frame his definitions except after much care. Before any scientific definition is made, there is always presupposed a certain amount of data, and definitions arise, when these data are critically considered. Any other definition must, in the nature of the case, be merely provisional. If, for example, there be required knowledge of what rock is, it is necessary to examine, not one rock, but many, and, having gone through this examination, then by analysis it is possible to pick out the essential constituents of rocks, that is, those characteristics, which are common to all the specimens examined. A statement then of those characteristics constitutes the definition. So with science. It would be a great mistake to consider only one science, and it might be just as serious a mistake to consider only one period in the history of science. What is common to the whole development will constitute the true definition for which we seek. Obviously, since there has only been presented so far an outline of early science, the definition, which will result, can only be said, strictly speaking, to apply to that period, but it will be seen, as the investigations continue, that the later history of science exhibits the same common characteristics, and, therefore, only serves to corroborate the conclusions here adduced as to the nature of science, even though they be drawn from the limited material already presented.

That which history has called science appears then to be differentiated from the ordinary course of everyday experience by the aim which characterizes it throughout. Now the aim which possessed the early astronomers was to understand certain movements of the heavenly bodies, that of the mathematicians to understand certain relations of numbers and certain properties of space, while those interested in mechanics tried to understand the motions and equilibrium of ponderous bodies. Often the data, with which these men were acquainted, were relatively very few, and often their suppositions were most crude; but these early pioneers had

set out for the goal which science still follows. These early thinkers were all interested in certain phenomena, or, to use a less ambiguous word, in certain given data. They tried to understand these facts, and in so doing first, endeavoured to give to themselves and generally to others a description in simple and clear language of the relation of the facts which they had observed; and secondly, posited that which they considered necessary for the facts to be what they were.

For example, the early astronomer observed the heavens night after night and day after day. Thus, he obtained the material, which it became his work to describe, but his task did not end with a description of the observed data; he formed certain theories, and assumed that by which the observed facts were regarded as explained. In the assumptions, he transcended the originally given data, for that which he posited as explanatory of the observed facts was not at all perceived to be connected therewith. It follows, then, that the definition of science, which will result from a consideration of the facts of this early period, must include first of all, and as part though not the whole of its content some such statement as the following,—science is a description of facts in clear and simple language. A word or two is necessary, perhaps, in order to show more fully the meaning of this statement.

The description, given in science, must be in clear and simple language. When Archimedes sought to understand the principle of the lever, he did so by describing the complex facts, which he was investigating, in terms of phenomena which he regarded as better known. As men, in their study of the movements of the heavenly bodies, advanced conclusion after conclusion, there was present, always, the aim to condense their conclusions into unambiguous, non-contradictory, clear and simple language, and the history of astronomy is the history of that attempt. So with other sciences. Any other method would have been an *ignotum per ignotius*. It may, of course, be necessary to use technical terms in the descriptions advanced; indeed, such become coined in these very descriptions but part of the aim of every science is to describe in less complex terms the more complex facts which it investigates. What else, indeed, was the geometrical method of Euclid and his predecessors, in its analytical aspect, than just such an attempt?

Taking certain complex data, they reduced these to less complex facts which everyone, as they thought, would accept as self-evident. Science makes an attempt then to describe the facts by the aid of the fewest and simplest general formulae; and, when men like Kirchhoff, Mach, Ostwald, Jourdain, Karl Pearson and J. A. Thomson, in modern times, emphasize the necessity of the economy of thought in science, they do not ask that simplicity be sacrificed to brevity. Again, it must be noted that, though in the early period there was relatively little experiment, yet all the facts described are not those which are given in mere observation. Experiment is observation under control and, in the mechanics of Archimedes, for example, there are definite illustrations of the use of experiment. Even in this early period of science, it was seen that hypotheses must be, if possible, verified, and, in this process of verification, experiment found an essential place. The facts described are then the result of both observation and experiment. Science requires, therefore, a description of facts in clear and simple language.

But it has been said above that science not only endeavours to make a description of facts, but, secondly, it posits, in its explanations, that which is considered necessary for the facts to be what they are. A complete and adequate definition of science, as it was in its early period and, indeed, as will be seen, as it has been throughout, must then include both these factors. Throughout this early development men were attempting to describe observed facts, that is indisputable, but it is just as evident that in their theories or hypothetical explanations, as they have been called, the early scientists were making predications in regard to that which was suprasensible or transcendent.

The vaults or domes of the heavens, believed by the early astronomers to support the stars and the planets, the central fire of the Pythagoreans, the eccentrics of Hipparchus and the epicycles of Ptolemy, these, as well as the infinite space of Euclid's definitions, were considered beyond the perception of these astronomers. It will be remembered that Hipparchus classified into six different magnitudes some ten hundred and eighty stars, giving to us, thereby, a splendid example of the description of observed facts, according to one characteristic, viz., that of intensity. It was a question of

classifying that which was actually observed, but, when he came to account for the apparent motions of sun and moon and planets, that is, certain observed changes in the relative positions of these and the observer on the earth, he went beyond these perceived data, and introduced the circular motions of the planets about an imaginary point not the centre of the earth. In so doing, Hipparchus had posited that which he had never seen. He was expressing a belief, advancing a theory, in a word, framing an hypothesis.

But it needs to be noted that in these explanations there was no transcending of experience, because the belief expressed was still a process of experience. Yet, in framing his hypotheses, the early scientist was quite aware that cycles, epicycles, eccentrics, central fires, etc., he had not perceptually observed, though he represented them as though he could see them were he in such and such a position.

A definition of science, resulting from the dual aim above outlined and adequate to the procedure of early science, and, as will be seen to later science, may, then, be stated in the following terms. Science is a description of facts obtained through observation and experiment, in clear and simple language, including the theoretical predication, as also attempts at experimental vindication, of that by which the facts are regarded as explained. "

From what has been said, it will be clear that science is not limited to any particular bodies of facts. It is, if one may make use of the metaphorical language, a method of approach, a frame of mind, an intellectual attitude, and is illustrated, as Prof. Thomson has suggested,[1] just as well by the business-man meeting some new practical problem, the lawyer sifting evidence, the statesman framing a constructive bill, as it is by the physicist, mathematician or astronomer. This attitude of mind is often contrasted with the practical, which is closely allied with art, and, again, with the emotional, which in turn has a close affinity with religion; but it must be borne in mind that this differentiation of the interests of men is, in the long history of mankind, a relatively recent thing, and that, in primitive times, man was at once practical, emotional and scientific, though, because of the stern conditions by which he was surrounded and the darkness and mystery which must have

[1] An Introduction to Science P. 58.

enveloped him, the practical and emotional characteristics were most influential.

From out this complex background of primitive culture, a background which was dominantly religious, there gradually evolved a scientific attitude of mind. It was that mental attitude the aims of which have been delineated above. But it is important to remember that for the early investigators this attitude was just as much philosophic as scientific. They had drawn as yet no distinction between the two terms. Science for them was philosophy and philosophy was science. It is probable, too, that, in all cases, primitive peoples tried to break down the gigantic barrier to knowledge by one great blow. In the case of the Greeks, there is, of course, actual historic evidence for this. But they failed. The universe was not thus to be understood. A better method must arise, and, just as from the dominantly religious attitude there had evolved a scientific or philosophic frame of mind, so gradually there became differentiated from this mental attitude the different special studies, by which means man has been able to make great advance. The rise and development and analysis of these special studies have formed the subject matter of the above discussion. An outline of the more general discipline arising from the various special sciences or special philosophies has yet to be done.

## CHAPTER III.

### The Development of the Definition of Philosophy.

In Plato's Republic, 480 b, those men are called philosophers, "who set their affections on that which, in each case, really exists", and, in the same work, 484 a, philosophers are defined as those who "are able to apprehend the eternal and immutable". But, in the Theaetetus, 143 d, the term philosophy is used in a wider sense, and there are included under it the special studies, which had, at that time, become differentiated. It is significant that, in the writings of Aristotle, the dual use of the word philosophy persists. In his Metaphysics, VI, 1, 1026 a, philosophy included mathematics, physics, ethics and poetics, but there is another use of the word, suggested in the same passage, to designate what he calls the science of being as such. This latter science Aristotle often called σοφια, instead of φιλοσοφια, but, generally, preferred to use in regard to it the phrase πρωτη φιλοσοφια. This he regarded as pre-eminently the science of the philosopher. Subsequent writers coined the word Metaphysics, which more or less by accident became afterwards applied to this special task, and, for centuries now, the word has been current.

Now the dual conception of philosophy, held by Plato and by Aristotle, clearly shows that the process of dividing the field of knowledge into different compartments, had, to a very fair degree, already been accomplished. It shows, furthermore, that these two men held that there was yet a task to be done, even though the special departments were carrying on to successful issue their independent investigations. It might have been supposed that, in the process of differentiation, all the necessary inquiry would be undertaken by the differentiated parts. But such was not the case. When there evolved, in the original complexity of man's primitive experience, that attitude of mind we have called either science or philosophy, because, as yet, the terms were synonymous, there still were certain religious and practical interests, and, so, when this new field became differentiated into special departments, there

still was a task to be performed,—a task, which Plato and Aristotle took to be the essential work of the philosopher, a task, which had not been delegated to the special philosophies or sciences.

It will be seen that the word philosophy retains, throughout a long history, the dual sense already given to it. It has included all the special investigations, that have been carried on, and, almost to the present day, the phrase, natural philosophy, has been used to designate the different natural sciences; but the essential significance of philosophy, its best definition in other words, will be found by following that trend of thought, which emphasized rather the peculiar function of philosophy, a function which it retained after the separation of the special disciplines had taken place.

In attempting thus to arrive at a definition of philosophy, the work of the early Greek speculators must be borne in mind, but interest will centre more especially upon Socrates, Plato and Aristotle, that great triad of thinkers, who influenced succeeding generations more than human mind can ever estimate.

Socrates, 469-399 B.C., marks an epoch in the history of human investigation. He was the son of a sculptor, and, at first, busied himself with the chisel, but his ardent desire for knowledge led him to absorb the new doctrines with which the streets of his native city echoed. He, however, was not to be dazzled by the brilliant rhetorical efforts, which were becoming so popular because of the teaching of the Sophists. His keen intellect penetrated behind the glittering words and phrases, and there he often saw superficiality and inconsistency. Such teaching was unsatisfactory to Socrates, whose moral earnestness led him to delve beneath the surface in the endeavour to discover true knowledge. Thus he came to hold it his duty to enlighten himself and his fellow-citizens concerning the emptiness of the ordinary Sophistic teaching, in order to prepare the way for a better comprehension of truth. With this end in view, he worked unceasingly and unremittingly among his fellow-citizens, facing with them the practical problems of daily life, until misunderstanding and intrigue finally brought him before the court, which condemned him to the death that has served only to heighten his glory and his fame.

The work of Socrates is known to us only indirectly, but historical criticism has agreed that in the Socratic method there is con-

tained the kernel of his teaching. The tendency of the teachers of his day was to supply the individual with a quantity of methodised knowledge. Socrates saw the futility of such a pedagogic method, and was one of the first to emphasize a more adequate procedure. Moreover, though the Sophists, as those travelling teachers, who flourished from 450-400 B.C., have been called, accomplished much that was good, especially along lines of grammar, the conclusions of the majority of them were definitely sceptical. This tendency was, no doubt, due to the positive influence of the Heracliteans, and the Atomists. But Socrates was not to be satisfied with any such conclusions, and his method is the result, mainly, of his attempt to overcome the argumentation of Protagorean individualism and the negative theses of Gorgias.

According to Aristotle's Metaphysics, XIII, 4, 1078 b 23, two things may justly be ascribed to Socrates. These are generally called Induction and Definition. These sum up his method and his aim. But to know whether these terms, in their ordinary connotations, are here applicable, one must study the actual process which Socrates used in concrete cases. Fortunately, many examples of this so-called Socratic method are given to us in the works of his brilliant pupil, Plato, and especially in those of Xenophon, the historian. The situations depicted in the Memorabilia of the latter show Socrates to be a man vitally interested in the everyday pursuits of his fellow-men; he endeavours, now, to find the essence of virtue, now, the duties of men under specific circumstances, now, he carries on animated conversations with Sophists, and, again, he is giving valuable advice to friends, generals, tradesmen, artificers. Socrates makes use of cross-examination, and, in so doing, reveals often the ignorance of the questioner; but he does not stop there. Once he has succeeded in making the pupil see the inadequacy of his own opinions, once that presupposition and bias are overcome, the teacher begins to lead the inquirer towards the shining goal of truth.

A splendid example of the preliminary stages of the method employed is found in the Memorabilia IV, 2. Euthydemus aspires to become a statesman, and Socrates, accordingly, is intent to show him the value of justice. Euthydemus thinks he can hold his own against all-comers as an upright man, and, when Socrates suggests

that they write down the initial letters of the two words, justice and injustice, and then place under these the different actions corresponding to each, Euthydemus quite readily assents. In the second column are entered such actions as lying, deceit, the enslavement of free-born men. These, Euthydemus says, clearly belong to the injustice category. But Socrates replies there are instances which appear to contradict this classification, for in time of war it is considered just to exhibit all these characteristics against enemies. Our conception of unjust acts must be modified to mean such acts as lying, deceit, etc., when practised against friends. But Socrates now gets Euthydemus to agree that, under certain circumstances, it is just to deceive a friend; for example, a general, to revive the courage of his demoralised troops, makes a false announcement of approaching allies, the anxious father administers by deceit the distasteful medicine to his sick son, the knife is stolen from the friend who might use it in a moment of mental aberration to his own destruction. Therefore the above actions are only unjust when done with the intention of injuring the persons affected by them. Euthydemus is thus led to see the complexity of the situation, and the inadequacy and self-contradictoriness of common opinions, and, though, in this special case, a formal definition does not result, there is well illustrated the general procedure which Socrates followed in leading toward such definitions.

If one turns to the third book of the same work, he finds in the third chapter a more complete illustration of the Socratic method. Socrates is conversing with a youth, who has just been elected hipparch or commandant of cavalry. He discovers to the young man that his object in desiring such a position was neither to ride at the head of the knights nor to obtain public notoriety, for even the mounted archers do the former and a madman might boast the distinction of the latter. His object has been rather to improve the cavalry, to hand it over to the state in better condition than he found it. Such an object can be achieved, Socrates points out, only if the hipparch improves both the horses and the riders, inculcating those qualities which will make them suited for battle. "And, have you troubled your head at all", says Socrates, "to consider how you are to secure the obedience of your men? For,

without that, not one particle of good will you get, for all your horses and troopers so brave and so stout." "That is a true saying," the youth replies, "but how, Socrates, should a man best bring them to this virtue?" Socrates answers, "I presume you know that in any business whatever, people are more apt to follow the lead of those whom they look upon as adepts; thus in case of sickness they are readiest to obey him whom they regard as the cleverest physician; and so, on a voyage the most skilful pilot; in matters agricultural, the best farmer and so forth. Then in the matter of the cavalry also we may reasonably suppose that he who is looked upon as knowing his business best will command the readiest obedience." In this case Socrates does not prolong unnecessarily the dialogue. It is a clear case of a fellow-citizen needing help, and it is given without circumlocution. He reveals in a sentence or two the necessary characteristics of a good cavalry leader, and, when the leader is nonplused to know how best to obtain the obedience of his men, Socrates proceeds to answer his difficulty by bringing forward various examples of obedience. In these concrete cases he is able to place his finger upon the common quality which belongs to all,—obedience is given to those who are most adept; and then he allows the leader to apply the conclusion to his own particular case, fitting into his own avocation the constituents of adeptness. Examples such as these might be multiplied from the Memorabilia. It is noteworthy, too, that, as is generally agreed, Xenophon's lack of a thorough-going philosophic training serves to make his reports of the conversations of Socrates all the more authentic.

In the works of Plato, on the other hand, there is certainly more danger of the argument being coloured by the particular philosophic views of the brilliant pupil. To discover how much is Platonic and how much is Socratic will always be a problem for the higher criticism of the Platonic writings. But it is reasonable to assume that the conversations put into the mouth of Socrates by Plato are, at least in their general outlines, true to the method which Socrates followed. Probably two of the best known works of Plato are the Republic and the Theaetetus. Both of these exhibit the great figure, which is likewise introduced to us in the Memorabilia, pursuing the same task. True, the poetic instincts

of Plato paint the situations with greater imaginative detail, and the plan employed follows often a devious and intricate path, but the general method and the general results are practically the same.

In the Republic the nature of justice is again the query; in the Theaetetus it is the nature of knowledge. In both cases there are advanced by certain of the audience current definitions, which Socrates critically considers and shows, finally, to be inadequate to evident facts. In the Republic, for example, justice is first defined as the payment of debts, which afterwards is interpreted as the rendering of good to friends and evil to enemies. To determine who are friends and who are enemies is, however, by no means easy, and so the definition is revised to read, it is just to do good to our friends when they are good and harm to our enemies when they are evil. Against this conclusion however it is objected that by injury men, no less than dogs and horses, are made worse, that is, less just and the paradoxical character of the result necessarily leads to a further revision. Here the character, Thrasymachus, rushes in with his rather hasty suggestion,—justice is the interest of the stronger. Governments make laws for their own advantage; justice is obedience to these laws. But Socrates points out that the stronger are not always infallible, and so, sometimes, may misunderstand their own interests, which would lead to legislation that would be to their own hurt; furthermore, it appears that, if the analogy of the physician and pilot be permissible, those that govern, or the stronger, legislate for the interest of the governed, or the weaker, so that the definition of Thrasymachus cannot be considered adequate. When Socrates, after thus removing false definitions and clearing the ground of presuppositions, commences to formulate his own definition, the poet-philosopher gives to his imagination full play. The nature of justice is sought, first, in the state, where perchance its nature will be written in larger characters. It is however only after he has constructed his ideal Republic and defined wisdom, courage and temperance that Plato, through the mouth of Socrates, at last happens upon the nature of justice. It is suggested by the principle of the division of labour within the state. When each one has and does his rightful share then is justice realised. Turning now to the individual, Socrates distinguishes in the soul three parts. Even as in the state, justice

consists in a harmony of these three, each part performing its own function. Now this definition, though it turns out to be for Socrates a true definition of justice, is as yet only possibly correct. It must yet be verified and so, Socrates brings before his eager listeners various examples of just men,—the man that is honest, he who is free of sacrileges, thefts, treacheries, he who is faithful in the performance of his oaths, he who is careful of his parents, who shows piety toward the gods; in all such, justice is exemplified, and the common characteristic of all these, as it is revealed by analys's, is that principle of division of labour among the qualities of the soul whereby each performs its own function not intermeddling with that of the other parts. The rational, appetitive and spirited parts of the soul are, in all these cases, in complete harmony, and this is, for Plato, justice in the individual, just as harmony among the different classes meant justice in the state. So then the definition, resulting, as a dream or a hope, or, to use the more modern word, an hypothesis, from the long literary part of the work is now by this brief analytic procedure shown to be correct. To quote the words of Socrates, spoken immediately after the above analysis has been concluded, "then our dream has been realized; and the suspicion which we entertained at the beginning of our work of construction that some divine power must have conducted us to a primary form of justice has now been verified."[1]

In considering these examples of the so-called Socratic Induction and Definition, the first thing that impresses one is the attempt which Socrates made to rid his students and himself of presuppositions. These presuppositions were presented generally in the form of current definitions which the keen intellect of Socrates was able to show were not in accord with actual facts. Then the attempt was made to ascertain the true nature of the matter under consideration. This is done generally by summoning up before the investigators various concrete examples of the subject, the common characteristic or characteristics are then ascertained by comparison, the differences being eliminated, and a statement of these common characteristics constitutes the definition which is sought. Sometimes the definition so obtained is then applied to some particular situation as in the case of the hipparch and his query concerning obedience.

[1] The Republic of Plato. P. 136. Jowett's trans.

That such a method is not induction in the general acceptation of the word is evident. Mill, an ardent champion of induction, defines it as the "operation of the mind by which we infer that what we know to be true in a particular case or cases will be true in all cases which resemble the former in certain assignable respects."[1] Now Socrates makes no attempt to reach a universal by summing up a number of particulars; his method is not an *inductio per enumerationem simplicem*, the meaning which the Scholastics, up to the time of Bacon, gave the word induction;[2] neither does he advance from particulars to a general truth by the method later advocates of induction have emphasized, except in this sense, a sense which is quite otherwise than that implied in modern induction,—he analyses out from the various examples before him the common characteristics and having done so he is able to formulate a definition. In this same way, by analysis or abstraction, all definitions which are more than merely verbal are formed. That is, his definition is an analytic product rather than an enumerated one. Modern science makes constant use of just this method, and those sciences, which employ classification, such as anthropology, biology, chemistry, etc., are virtually dependent for their progress upon just such a method. It was this that led Windelband in his History of Philosophy, p. 95, to say, "it will remain a noteworthy fact for all time, that a man, who so narrowed for himself the intellectual horizon of scientific research as did Socrates, should yet determine within this the essential nature of science itself, in a manner so clear and authoritative for all the future."

The method of Socrates then may be described as analytic rather than inductive. It is his great contribution to the history of thought. The content within which this method was used by Socrates was, in the main, the moral realm. As Cicero said, "Socrates called philosophy down from the heavens to earth and introduced it into the cities and houses of men, compelling them to inquire concerning life and morals and things good and evil."[3]

The two most brilliant followers of Socrates, viz., Plato, 427-347 B.C., and Aristotle, 384-322 B.C., widened the scope of their investigations. For them conduct was but one question, though

[1] System of Logic, Bk. III, Ch. 2.
[2] For the development of the doctrine of induction, cf. Welton, Manual of Logic. Vol. II Ch. 2.
[3] Acad. post, I, 4, 15.

a very important one, no doubt, among many. It has been already mentioned, at the beginning of this chapter, that the word philosophy was used in a dual sense by both Plato and Aristotle. The word is used by each as a class-name, including under it all the special studies which had arisen. But the significance generally attached to the term is quite different from this. To consider Plato first,—the concluding sentence of the fifth book of the Republic defines as philosophers those "who set their affections on that which in each case really exists." Now what does Plato mean by that which in each case really exists? To understand the answer to this question involves a statement of Plato's doctrine of "Ideas", which forms the very heart and centre of his system and around which all else circulates.

It will serve as an introduction to this theory of Ideas if there be stated here that classification of knowledge, which Plato gives in the sixth book of his master-work, the Republic. It has been decided that at the head of the commonwealth there must be placed men trained in philosophy. "There can be no cure for the ills of a State or, as I think, of the whole human race, until political power and philosophy are united, until either philosophers become kings or those who are now called kings and potentates begin to pursue philosophy not superficially but in the true spirit."[1] To describe the training necessary for the philosopher-statesman, part of the sixth and the whole of the seventh books are devoted. After the study of mathematics, including arithmetic and geometry, and astronomy there next comes the investigation of "that which in each case really exists", or, as it is expressed, the students are now prepared for the study of philosophy itself. According to the scheme outlined by Plato there are four grades of knowledge, the first or lowest is called εἰκασια, the next is πιστις, the third is διανοια, while the highest of all is νοησις or ἐπιστημη. The first two compose the realm of δοξα, opinion, and might be translated as conjecture and belief or conviction; διανοια, understanding, reasoning through things, is not quite on the same level as νοησις or ἐπιστημη, which for Plato are synonymous with Reason or pure knowledge. In conjecture, knowledge is of "images" only, a mere guess-work; in belief, knowledge is of

[1] Rep. Bk. V.

"bodies", and is still sensible knowledge; corresponding to the third process of knowledge are mathematical objects, but because mathematics does not dispense entirely with the data of sense or with hypothesis, it is not the highest study; it cannot be reckoned as true philosophy, for the objects corresponding to ἐπιστημη or pure knowledge are quite beyond the realm of sense. These objects are called by Plato Ἰδεαι. They are the Ideas.

And now it is time to ask what these Ideas are with which Plato's philosophers are to become busied. True knowledge for Plato consisted, it seems, in the contemplation of these Ideas, and these, whatever else they may be, are regarded as having no sense-content. Surely, it is objected, this is diametrically opposed to modern science, since, for modern science, that which is given in sense-experience is of the utmost value, while, for Plato, it would seem, all such counts as a hindrance and a barrier to the higher knowledge. But before it can be agreed that Plato's conception of science differs so widely from that of to-day, it must be determined more clearly what is meant by the word Idea, and what significance there is in Plato's doctrine of Ideas.

The following passage from the Metaphysics XIII, 1078 b 9 presents Aristotle's view of Plato's theory. "Now regarding the Ideas, we must first examine the Ideal theory (theory of Ideas) by itself not connecting it in any way with the nature of numbers but treating it in the form in which it was originally understood by those who first maintained the existence of Ideas. The supporters of the Ideal theory were led to it because they were persuaded of the truth of the Heraclitean doctrine that all sensible things are ever passing away, so that, if knowledge or thought is to have an object, there must be some other abiding and permanent entities, apart from those which are sensible; for there can be no knowledge of things which are in a state of flux. Socrates occupied himself with the excellencies of character, and, in connection with them became the first to raisethe problem of universal definitions. . . . . For two things may be fairly ascribed to Socrates—inductive arguments and universal definition, both of which are concerned with the starting-point of science. But Socrates did not make the universals or the definitions exist apart; his successors, however, gave them separate existence, and this was the kind of

thing they called Ideas. It followed, as an almost direct consequence of their mode of argument that there must be an Idea wherever there is a general term; and their procedure much resembled that of a man who, having to count a number of objects, should think he could only manage if there were more of them,—for the Ideas are just a reduplication of the things of sense. . . . . There is an Idea of the same name answering to each group of sensible substances, and existing apart from them."

In reading the interpretation by Aristotle of the Platonic doctrine of Ideas, it must be remembered that, though Aristotle was a pupil of Plato, yet his conceptions and report of his master's teaching might readily have been altered by his own special views. And this is all the more probable because, as Aristotle himself is careful to indicate, his metaphysics does not contain, strictly speaking, a history of preceding thought. His avowed purpose is to show how previous thought had served as an introduction to his own "First Philosophy". He therefore, as Burnet and Taylor, as well as others, have pointed out, looks upon Plato's and all earlier works as introductions to his own. But, if one bear this in mind, the report of Aristotle cannot but be of inestimable value in comprehending Plato's theory of Ideas. The selection given above shows that Plato was much indebted to Socrates, who, it will be remembered, endeavoured to find by analysis the essential characteristics of ethical actions. His aim was to find and define concepts, and the first period of Plato's work exhibits Socrates' pupil pursuing a similar task; as Gomperz says, in the "first series of his writings Plato appears as an ethical conceptualist".[1] Not only was the brilliant pupil, however, influenced by the method of Socrates, but also by the speculations of the Eleatics and Pythagoreans, and this, combined with the effect of the religious beliefs of Orphism upon Plato's poetic and imaginative nature, led him in the course of his development to transcend the teachings of Socrates. He devotes his interest to problems respecting the soul, its nature and destiny, and gradually there results the theory of Ideas, and, in the Republic, that mighty edifice, which, as someone has said, houses in its many chambers all the parts of the Platonic system,—in the Republic, there is placed before the reader his

[1] Greek Thinkers Vol. II, P. 289.

conception of philosophy as the science which contemplates these Ideas, the science par excellence.

Aristotle says that the successors of Socrates, and he refers clearly to Plato and his followers, took the Socratic concepts and ascribed to them a separate existence. These hypostasized concepts are then the Ideas; to every concept there corresponds an Idea, and, just as the former may be classified, so the latter may be classified; and thus there is a whole hierarchy of Ideas, the culmination of which is the Idea of the Good or Idea Good. Ordinary sense-perception furnishes only the suggestion or promptings, with the help of which, according to the myth, the soul bethinks itself of the Ideas, of which in its former existence it was fully cognizant. This is the kernel of Plato's doctrine of ἀναμνησις or reminiscence. Philosophy then consists in the contemplation of these Ideas, they are "that which in each case really exists". To express the relation of individual sense things to the Ideas becomes the problem which Plato must face. Whether Ideas are the only real or not makes not a whit of difference to the fact that there are things of sense, and Plato was far too sagacious and much too honest to ignore or deny that. Individual things are imitations of the Ideas, or they participate in them; the Ideas are, in some sense, present in the individual things; but, further than these suggestions Plato did not go.

It was in this connection that Aristotle made his greatest criticism of Plato, but yet Aristotle himself was not to overcome entirely the same difficulty. To these early thinkers the moral aspect of human imperfection—the problem of evil—seemed so acute that they could not succeed in surmounting in their theories the "necessity" and the "contingency", which were so obvious in the world about them.

Before turning to the Aristotelian criticism of this theory of Ideas and to the special system of the Stagirite himself, it must be said that there is possible an interpretation of the Ideas of Plato different from that which Aristotle and practically all succeeding writers have held. The latter view, as has been suggested, advances the belief that Plato gave to the concepts a noumenal existence, making them the Ideas. But may it not be that the Ideas which are given suprasensible existence are not the concepts of Socrates plus suprasensible existence, but rather supposed ob-

jects, if one may make use of the word in this connection, which correspond to the concept, the latter still retaining the place which Socrates had given them? Then there would be first, individual sensible things, secondly, concepts, obtained by analysis, and thirdly, the suprasensible Ideas (objects) corresponding to the concepts. Such an interpretation would save Plato from attempting the impossible task of hypostasizing concepts, it would also give him credit for having seen, as, for example, Kant did centuries later, that the experience of the individual is constantly demanding completion, a completion which is in part realized by the positing of certain Rational Ideas, to use the Kantian phrase. Religion always has ventured upon this task; science follows the same method, for part of its aim was seen to consist in the positing in its theories of that which was accepted as explaining the given facts. Plato had behind him a religious background which certainly influenced him tremendously, he too was well aware of the methods employed in the particular disciplines of his day and, in his endeavours to understand these and human experience in all its relations, it would be a most natural thing for him to emphasize these Ideas, which were not concepts nor obtained as the latter were, but which were predicated as completions of that experience. No doubt, the language that he used was open to misconstruction and, probably, yes certainly, the Platonic schools did not grasp the significance of the procedure of their master, if indeed, Plato himself fully realized it, but it seems at least a reasonable interpretation to place upon his writings and one much more in accord with the remarkable genius of the man who, for so many centuries now, has in great part shaped and moulded the thought of the Western world.

Under any circumstances, Plato's teaching is not so different from that of modern science as might be supposed, for he never forgets the importance of concepts. Even though, at times, his poetic temperament tends to make him soar above the things of sense, yet he still realizes that the hard, brute facts of this mundane world are the starting-point of investigation. However much he may love to contemplate Ideas, yet he does not blind his eyes to the necessity for an explanation of the things of sense, and furthermore, in the very positing of his suprasensible Ideas, he still, it would seem, is pursuing a method which science, throughout its long his-

tory, has actually followed as it has attempted to explain the given facts. For science itself makes a distinction similar to that which Plato made between concepts and Ideas. Science not only has arranged its data under definite classes, but, in many of its explanations, it goes beyond the perceived data and concepts derived therefrom, and makes such predications as the infinity of the universe in space and time. Predications of this kind are quite different from concepts obtained by the scrutiny of individual perceptible things.

The criticisms, which Aristotle made of the Platonic theory, are specified in the ninth chapter of the first book of the Metaphysics. They resolve themselves into two main objections; first, that the proof for the existence of these Ideas are all inadequate, and secondly that, even if the Ideas did exist, they would be useless, for since they are by hypothesis outside things, they cannot therefore afford any explanation of our knowledge of things or of their existence or change. Aristotle endeavours to form a system which will not be subject to such criticisms, and the first great difference which must be noted is that, in his writings, everything in experience is equally worthy of regard and investigation. The result is that, unlike Plato, Aristotle gives a prominent place to physics, using the word in a broad sense as including biology and embracing everything which he classified under the head of movement.

In various parts of his writings, Aristotle suggests classifications of the disciplines of knowledge differing slightly one from the other, but that which he apparently deemed most important and far-reaching is the classification of knowledge into Theoretical and Practical. The distinction corresponds roughly to the modern one drawn between science and art. For Aristotle, Theoretical knowledge sought to know, Practical knowledge sought to do. There are three main branches of Theoretical knowledge, First Philosophy, Mathematics and Physics, and, in his Metaphysics, Aristotle explains in what way mathematics and physics differ from first philosophy. Physics, he says, deals with objects that are not separable from matter and motion, mathematics with objects not separable from matter, but first philosophy "deals with things that are both separable and immovable"[1]. At first sight, this appears

[1] Meta. VI, 1, 1026 a 16.

very similar to the Platonic theory, for things separable from matter and immovable are surely suprasensible and, as such, must differ but little from Plato's Ideas; but this is not Aristotle's meaning, for he goes on to explain that the task of this first philosophy is to consider being as such, το ὀν ἡ ὀν, both what it is and the attributes that belong to it as being.[1] The physicist studies being as composed of bodies in motion, the mathematician studies being as possessing number and spatial form, but first philosophy asks what it means to be. It abstracts from all the particulars the one most common quality, viz., being, and in that sense it is more general than physics and mathematics, it is indeed most general of all. The general principles resulting from this first philosophy will be applicable everywhere, whereas those of the second philosophies, mathematics and physics, are applicable only within a certain territory. The development of this doctrine of being results in the Aristotelian system.

True to his avowed purpose not to commit the error of Plato, Aristotle commences his work by an investigation of individual things. The logical analysis of every individual being or substance, οὐσια, gives Aristotle what he calls the causes or first principles of being. These causes are strictly four and may be designated material, efficient, final and formal, but, since the formal may be thought of as including the efficient and final, there are practically two fundamental principles or causes, the material and the formal. Every individual being is what it is because of the operation of these two causes. Neither pure form nor pure matter exists in the realm of determined being; the individual substance is a συνολον, a totality of matter and form. But the terms matter and form are relative; that which is form in regard to one thing may be matter in regard to another. For example, wood may be considered the form for the unhewn tree, but it is matter in relation to the completed house. What holds true of individual things is also true of the sum-total of things, for matter and form are principles which run throughout the whole development. Now everything that is determined is for Aristotle in a process of change, κινησις. And this process consists in a taking on of form by matter; the higher the stage of evolution, the more there is of form and the less of

[1] Meta. VI, 1, 1026 a 33.

matter. In other words, throughout the whole process of κινησις, there is a movement from the less actual to the actual, or rather, as Aristotle says, from Potentiality to Actuality. It is, however, impossible for Aristotle to conclude that pure actuality unmixed with potentiality, or form unmixed with matter is unnecessary for development, and here the Stagirite advances that portion of his argument which leads him finally into the very same difficulty which Plato had experienced. Individual things arise in the process of development because of the joint operation of form and matter; the gradual preponderance of form constitutes the gradual ascent in the scale of being. But what about the first and the last stage in the process? Are there pure matter and pure form? Aristotle calls the last remainder after abstraction, as one goes down in the scale, first matter, πρωτη ὑλη. It is the bare potentiality of all that is actualised in the realm of change, is merely inferred, and can be known, if at all, only by analogy. On the other hand, as one ascends in the scale, there is pure form, or pure actuality, and Aristotle insists that without such a conception there could be no movement at all. Logically, pure actuality, he holds, must be first, for without such a conception there could be no movement, since all movement implies an efficient cause. The series of causes cannot be infinite and so he posits a first mover, itself unmoved. This first unmoved mover is, for Aristotle, God. He is pure actuality, pure form and, since to say that he contemplates the realm of existent things would be to determine him[1] by something outside, Aristotle is led to say that the prime mover is νοησις νοησεως, thought of thought, pure contemplation.

In this aspect of his teaching, it will be seen that Aristotle approaches the Platonic doctrine. Indeed, it may be said that the Idea of the Good in Plato is, in no sense, different from the prime mover of Aristotle. In separating this prime mover from the things of sense Aristotle commits the very same mistake, if mistake it be, for which he so drastically has criticized Plato. Furthermore, if Plato had difficulty in stating the relation of ideas to things, and could be accused by his pupil, Aristotle, of using, in his explanation, metaphors only, such as imitation and participation, no less had Aristotle difficulty in explaining the relation of his prime mover to

[1] Cf. Meta. XII Ch. 9.

things, and the analogy which he uses of the lover being drawn to the beloved is none the less metaphorical. If there was a dualism in the system of Plato, the same may be said of the doctrine of Aristotle; indeed, there, it is even more apparent perhaps, because it evidences itself not only in his doctrine of the prime mover and the world, but also in his belief in an intractable contingency or irrational element within the world, as well as in his doctrine of Active and Passive Reason.

Again, there is a misuse of words amounting to a logical inconsistency in Aristotle, for he applies the term "form" to denote the result of abstraction and continues to use the same term in the phrase "pure form", referring to the prime mover. But it is not by a process of abstraction that Aristotle reaches this latter conception; the prime mover is, with him, rather a postulate, it is predicated as a completion of the development, and, since it is not obtained in a way similar to that in which the forms of things are determined, the word, form, even though modified by the adjective pure, cannot consistently be applied to the prime mover.

In one outstanding respect, the conclusions of Aristotle differ from those of Plato. For the latter, there are many Ideas, though, of course, there is one highest archetype,—the Idea of the Good,—while for Aristotle there is but one prime mover. In other respects the results of the speculation of these two great thinkers are, after all, not so diverse. Though each started out in his investigations upon apparently opposite roads, yet the final destination of each is practically the same.

Having thus passed in review the teachings of these three great thinkers, it is now possible to approach the question, what is philosophy. A definition of science resulted from an analysis of the data and method of early science; and now, in the same way, a definition of philosophy should result from an analysis of the material presented above. That Plato and Aristotle used the word, philosophy, in a double sense is significant. It shows that, in their day, a process of differentiation was going on, and that, as a result, the word, philosophy, was being given a new meaning. And yet, since the older meaning still survived and indeed has remained for long in use, it would be wrong to ignore that use of the word. Philosophy in that sense, it has been seen, was synonymous with

science. The different special sciences were likewise special philosophies.

But there arose, as has been seen, a new meaning for the term and it is this that must be determined. First of all, it must be stated that philosophy,—the term is now used in its newer sense,—is a specific study evolving from a more general intellectual attitude. Such an attitude, since it is strictly speaking not correct to call it either science or philosophy, we have called "science-philosophy". From this science-philosophy, or general observation of phenomena, there have been differentiated special studies, which have been designated special sciences, and then, from these disciplines, there arises, because of their diversity, the necessity of another investigation having the content and the mode of procedure of these disciplines as its subject-matter. This investigation is philosophy, in that strict usage of the term by which it is differentiated from the special scientific disciplines. Thus, the πρωτη φιλοσοφια becomes last philosophy.

An examination of the material presented above shows that philosophy, even in its historic beginnings, approached this subject-matter with the true scientific spirit. If science be an attempt to describe and explain facts, then philosophy too is a science. The facts with which it deals are, however, not the facts of any one special science. Philosophy takes as its subject-matter the content and method of procedure of all the sciences. And so it may be said that philosophy approaches the facts of life, including those of scientific knowledge and procedure, and endeavours to co-ordinate them all in a comprehensive, self-consistent theory.

The work of Plato and that of Aristotle were just such attempts. Socrates, however, appears to have made no attempt to form such a view, since he was mainly concerned with a definite set of data, viz., the ethical. Yet, because he had a wonderful influence upon Plato and Aristotle, and, through them, upon succeeding philosophy, he deserves an even more important place in the history of philosophy than has generally been accorded him. His own particular work, however, was that of a special scientist. He was a student of a special territory of knowledge to which the word, ethics, has been given, and, in that he emphasized if not first formulated the scientific method of obtaining concepts and definitions, he is worthy, too, of a prominent position in all histories of science.

Philosophy, then, may be defined as the scientific attempt to form a world-view, which gives a rightful place to all the known facts. Now, though it is apparent that both Plato and Aristotle attempt just such a task, yet it must not be overlooked that the definition, which each gives of philosophy, seems to suggest a different function for that discipline. These definitions have already been stated. For Plato, the philosopher is he who sets his affections upon that which in each case really exists, which becomes tantamount to saying that the philosopher is he who sets his affections on the Ideas, and philosophy then would seem for Plato to consist in the contemplation of these Ideas. Philosophy, first philosophy, for Aristotle is the science of being as such. But these definitions are not intrinsically different from that given above. In the case of Plato, the Ideas are the supposed explanations of the world of sense. It may be difficult for him to tell just in what way they are so explanatory, but, nevertheless, that is his firm belief. He who contemplates the Ideas is, therefore, endeavouring thereby to understand the universe and to form a complete view of the same. Again, in the case of Aristotle, being as such was his phrase for the common basis of all things. The four principles or causes of being which resulted from his analysis he uses to explain all, and, therefore, the science of being as such is for him that science which endeavours to give a complete account of the known facts. Thus, in the development of human thought which, in the period just covered, finds, in a sense, its culmination in Plato and Aristotle, we have a final definition of philosophy being evolved.

If it be objected that the subject-matter and aim of philosophy are different from those just outlined, that philosophy does not have as its subject-matter the content and mode of procedure of the sciences, and that it does not attempt to co-ordinate all the known facts into a world-view, then, it must be asked, what else is philosophy, what other than this is its subject-matter and what its aim ?

It has already been suggested that, before the differentiation of the general background of thought into the special sciences had taken place, there was, strictly speaking, neither science nor philosophy. The work of Thales, for example, was for him neither philosophy nor science. Seeing that his general aim was to form a world-theory, they who lived contemporaneous with or subse-

quent to the Platonic-Aristotelian differentiation might apply the name philosophy to his teaching. For Thales, his work was, however, neither science nor philosophy, simply because the distinction had not, in his time, been made. For this reason, it is logically incorrect to speak of the relation of science and philosophy before the time of Plato. But history subsequent to his writings is, as it were, a great stage upon which the two characters, science and philosophy, play important and yet extremely varied roles. A delineation of the part played by each and of the interrelations of the two must now be entered upon.

## CHAPTER IV.

### The Subordination of Science and Philosophy.

"With the age of Aristotle, Grecian civilization stepped out from its national restrictions and into the great general movement in which the peoples of antiquity that dwelt about the Mediterranean, through interchange and adjustment of their ideas, became fused into one common civilization." Thus Professor Windelband commences the second part of his History of Philosophy. The intellectual life of man is always closely connected with the general movement of civilization. Systems of philosophy and advances in the special sciences, despite apparent evidence, at times, to the contrary, do not arise *e vacuo*, and the thought of the Græco-Roman world is no exception to this rule. This fusion of different elements, which resulted in the "one common civilization" of which Windelband speaks, reveals two dominant characteristics, the ethical and the religious, and so the views of the world that arise show these same general traits. The ethical period finds its centre, still, in Greece, and is earlier than the religious period; the latter is developed mainly in Alexandria, but, gradually, gains such prominence that, taken over into the thought of succeeding centuries, it is enthroned in the very heart of Scholasticism. The representatives of the first period are the Epicureans and Stoics, those of the second development the Neoplatonists, Gnostics, and early Church Fathers.

Philosophy, it has been seen, consists in a scientific attempt to form a world-theory, which gives a rightful place to all the facts. Any attempt which bases its theory upon and includes only a few of the facts will be necessarily inadequate, and, for that reason, the world-views advanced by the thinkers of the Græco-Roman world are less deserving of the name philosophy than those of Plato and Aristotle. The Epicureans and Stoics were especially impressed by certain facts of man's moral life and certain theories in relation thereto. This was a result to be expected, for the teaching of the Sophists and of Socrates, Plato and Aristotle had led men to pay more attention to the individual, his desires and motives. And

further, the crumbling political life of Greece, with the consequent loss of national independence and national spirit, provided an opportunity for men to turn their eyes toward the welfare of the individual man. So it came about that the world-views advanced by the Epicureans and Stoics were unduly coloured by certain dominating ethical interests.

Epicurus and his followers taught that it is the business of philosophy to make human life more tranquil and more peaceful. The fear of the gods, implying, as it then did, a veritable maze of superstition and terror, they held to be the chief disturbing element in man's experience. Therefore, they endeavoured to free men from all fear of the supernatural.[1] The gods may exist, yes do exist, consensus of opinion, they taught, is enough to prove that, but, in their far-off home, they enjoy absolute repose[2] and are troubled neither by the miseries nor by the happiness of mankind. There is no intercourse or connection between the supersensible gods and sensible things. The Democritean physics,—atoms and the void,—are a sufficient explanation of the world.

The Stoics, as a class, were nobler men than the Epicureans, and have had a much more abiding influence. Their dominant interest is likewise ethical. Man seeks happiness, happiness consists in conformity to Nature[3], in other words, to the Law of the universe, and here their teaching mainly centres. God, they held, is not pure transcendence, as they understood Aristotle to teach. The universe is a living being and God may be identified with this universe or likened to its soul. The world, then, is the body of God, and, as such, must be a perfect organism; God, as its soul, is the governing intelligence or sovereign law. Ethics, then, is of paramount importance and a world-theory of value only in so far as it contributes thereto.

The Epicurean and Stoic systems proved to be unsatisfying to many. There were some, like Pyrrho of Elis and Carneades and Aenesidemus, who threw up their hands in despair, hastily concluding, like many another at different eras in the history of thought, that it is impossible to form an adequate world-theory, basing their sceptical inferences mainly upon what they called the rela-

[1] Lucret., De Rer. Nat. I, 62 ff.; Diog. Laert. X, 123 f.; Ibid. X, 143.
[2] Diog. Laert. X, 139.
[3] Cf. Diog. Laert. VII, 87.

tivity of knowledge. Those who claim that there is no absolute knowledge, that all is relative, generally overlook the logical inconsistency of their own position. Their words are self-condemnatory, for, if their absolute statement be true, then is their thesis disproved.

There were others, however, who, when the philosophy of the day failed, turned longing eyes to religion. But the old Greek religious beliefs had been found inconsistent and were now no longer tenable; the nobler religious teachings of Plato and Aristotle were but vaguely remembered, the Epicurean indifference and the Stoic resignation having made them, unfortunately, too much a thing of the past. The needs of the intellect would at last, without doubt, have been sacrificed to those of the heart had not Christianity, with a view of the world different from those of Epicureanism and Stoicism come into the lives of men to renew again their hopes and illuminate once more their thoughts.

The success of Christianity lay in great measure in this, that it soon learned to use the philosophic language of the day in formulating its doctrines. Having done so, the minds of men found in Christian theology some answer to the problems that had beset them. Religion, or rather theology,—for the facts of the religious life should always be clearly distinguished from the theoretic interpretation of the same,—theology became now the dominating influence and philosophy grew to be utterly subordinate thereto. As one looks back over the pages of history, he cannot but feel that the thought of that day committed a most egregious blunder. It was a mistake, which was to plunge the world into the night of the Mediaeval Ages, a mistake whereby the true office and nature of philosophy were to be forgotten, the relative value of religion and theology transposed and the nature of scientific method utterly misunderstood. Philosophy, thus being reduced to a hand-maid of theology, was in a precarious situation, for not only was its genuine task ignored, but, peradventure it should fail in establishing the theses of theology, it would straightway be not ignored but condemned. And therefore a world-view would be propagated, which was not formed by the scrutiny and interpretation of the facts of human life and conduct, but which would be based exclusively upon the dicta of authority.

Philosophy should have endeavoured to comprehend into a system the results of the different sciences with the results of religious life and belief,—that would have been its proper task. Theology would still have had its important part to play. But to make philosophy subordinate to theology, to make it the servant, even slave, of theology, was a most unfortunate procedure, one quite similar however to that which the Epicureans and Stoics had followed, but fraught with much more lamentable results. A proper philosophy cannot be predominantly an ethical philosophy, neither can it be predominantly a religious philosophy. In the first period of Græco-Roman thought, however, philosophy was the former, in the second period it was the latter. This second period included, as has been said, the work of the Neoplatonists, Gnostics and early Church Fathers.

Neoplatonism is decidedly a religious philosophy. Its most prominent representative was Plotinus, 205-270 A.D., who made a last supreme effort to withstand Christian thought. His aim was to formulate the chief doctrines of Greek and Hellenistic speculation into one religious system. But Neoplatonism failed as a religious system, and failed, too, as a philosophy,—failed as a religious system, because of the overwhelming success of Christianity, and failed as a philosophy, because it committed the error, common to its day, of building a world-theory upon too narrow a basis of fact. The failure of Neoplatonism left Christian theology free and untrammelled. It was a dangerous freedom however, because it was to lead to a calm serenity and self-confidence and contentment which, later, permitted stagnation and decay. It meant, too, the utter subversion of the true function of philosophy. Certain of the early Church Fathers, Tatian and Tertullian for example, were induced to show a violent aversion to philosophy, because of the rather alarming growth of Gnosticism, but the majority of them assumed an entirely different attitude. Philosophy, in the hands of Justin Martyr and the apologists generally, and later with Clement and Origen, became a valuable adjunct to theology. By its help and with its terminology, the Church Fathers were enabled to formulate their creeds. Now, that philosophy may be of assistance to theology is not to be denied, but to conceive its function as that of an assistant, a hand-maiden only, is to misunderstand its

true nature. Philosophy should take its independent stand upon the content of all empirical disciplines and thus attempt to formulate its theory of the universe. But this the thought of the Mediaeval Ages failed to comprehend.

The history of Mediaeval philosophy may be divided into two periods. Roughly speaking, the year 1200 may be taken as the dividing date. At the threshold of the first period stands Augustine, 354-430, the Des Cartes of his day, whose theological views became a dominant factor in the theology of the Christian church for many centuries. Augustine held that true philosophy was not to be despised, for Reason is God's first-born Son. Revelation and Reason are at one in their conclusions; belief is, chronologically, prior to knowledge however, though knowledge is the ultimate goal. It was this last tenet in the teaching of Augustine, expressed in the phrase, *credo ut intelligam*, which had so powerful an effect when, after the dissolution of the Roman Empire, Scholasticism arose, the avowed purpose of which was to defend and develop the doctrine of the Church. The Church had now come to be considered as the sole depository of the truth. Outside her there is neither salvation nor science. The dogmas, as formulated, became fixed and permanent. They are truth. It is no longer necessary to search for knowledge. Under such conditions, there is only one thing for philosophy to do. It cannot perform its proper function, and when Scotus Erigena and Anselm commenced their work, they conceived their task to be that of defending by the aid of philosophy the doctrines of the Church. Like Augustine, Anselm held that one must first believe in order to understand. But he went even further than Augustine in his superstitious reverence for the dogmas of the Church. No Christian ought ever to doubt the beliefs and traditions of the Holy Catholic Church. He must strive as humbly as possible to understand her teachings, if he succeed, let him thank God; if he fail, all the more reason for humility and reverence for the wonderful body of Truth vouchsafed to the Church.

It is not difficult to see that such an attitude of mind is directly opposed to the truly scientific, which commences its investigations without presupposition, which sees in every fact of life something to be reckoned with, and which, when in that form of science called philosophy, endeavours to explain all the facts by compre-

hending them into one world-theory. The tyrannical reign of dogmatic theology was, however, not to last forever, and, with the rise of the second period of Mediaeval philosophy, signs of a newer life are evident.

At the beginning of the thirteenth century Christian Europe, it would seem, knew nothing of Aristotle's writings except a part of the Organon, and that was mainly misunderstood. But, owing to the Arabians, who in the eleventh and twelfth centuries had translated and commented upon much of the rest of Aristotle's work, Christian students in Europe were gradually becoming acquainted with his ethics and metaphysics. The Church, coldly conservative, at first paid little attention to this innovation but soon began to discern signs of trouble, and so in 1209 it condemned Aristotle's physics and in 1215 his metaphysics. Nothing should rival its imperious authority. But it had made a mistake, and in 1250 the Church revoked its decisions and permitted lectures on Aristotle to be given, seeing the possibility thereby of gaining a powerful ally. In 1300 the Stagirite was the Church's official philosopher, and to contradict him was tantamount to heresy.

Thomas Aquinas, the greatest of the Scholastics, tried to reproduce for his own day the Aristotelian system, confident, too, that the philosophy he was establishing was not at variance with the teachings of the Church. But the separation and definition of the territories of each discipline militated against their union. Philosophy was gradually emerging from its theological thraldom and, having received official sanction from the church, and, having been given again a more or less definite task apart from that of theology, it was beginning a new development. The separation of philosophy from theology was hastened by the attitude of such men as Duns Scotus who, jealous for the fame of the Franciscan order, undertook a criticism of Aquinas, and fearlessly championed reason as a higher authority than revelation. Another factor of tremendous influence was the ultimate triumph of the opponents of Realism in the great controversy over the universals, as it is called. This controversy formed one of the outstanding features of the history of thought in the Mediaeval Ages. The problem was formulated at the beginning of the period in very concise language by Porphyry in his "Introduction to the Categories of Aristotle",

but its roots may be found in a very much earlier period, being implicit even in the Presocratics and attaining importance in the work of Socrates, Plato and Aristotle. Nor is the problem one which has lost interest for the present, for the formation of concepts and their relation to so-called individual things is a very important modern question. In the Mediaeval Ages, there were, at first, two positions taken, one of which claimed that the concepts or the universals are *ante rem* and constitute in themselves reality. The advocates of this view were called realists. The other party said the universals are derived from individual things by abstraction and are therefore *post rem*. The universals are mere words, names (nomina), and so they were called nominalists. An outstanding attempt at a reconciliation of these positions is known as conceptualism, which, as advocated by Abelard, claimed that *universalia sunt in rebus*. Conceptualism was really a synthesis of the two opposing views with a special emphasis, however, upon the fact that the universals exist in the individuals and are therefore realities. The result of the controversy was, by no means, favourable to the realists, and, when William of Occam, following the example of Roscelin of an earlier date, championed nominalism, it was to the great discomfiture of realism. But the Church considered its very foundations in regard to its hierarchical organization as well as in regard to its dogmas to be attacked when realism was in danger. For, since the great dogmas of the Church and its institutions were ideas, considered as fundamental realities, their validity seemed lost when the universal ideas were regarded as merely names. This, applied for example to the dogma of the Trinity, became a serious matter. So it came that Occam incurred the condemnation of the Church, and philosophy, with its nominalistic tendencies, for long in slavery to theology was gladly given its liberty.

But philosophy seemed unable to carry on an independent investigation; it could not so soon appreciate the possibilities of a new position and a new freedom, and so it exchanged the authority of the Church for that of Aristotle, appropriating his conclusions rather than his spirit of inquiry, a procedure which meant a less servile position, perhaps, but one which just as effectually hindered its achieving any real results. The consequences of this unfortunate step were extremely important in the succeeding cen-

turies, chiefly because it meant the continuation and acceptance of a method which could lead to no advance; and, had it not been that a different method and a truer one was developing with significant rapidity, philosophy would still be engaged in a task of little practical value and of no scientific worth. This new method was being introduced by the special sciences, the ever-increasingly wonderful investigations of which were greatly accelerated by the Renaissance period.

Throughout the Mediaeval Ages, the thoughts of men had been centred mainly upon theological questions, and the special sciences had been sadly neglected and even ostracized. Here and there were faint glimmerings, which gave hope of a fuller dawn, though no general acknowledgment had been given to the feeble but nevertheless significant gropings in mathematics, astronomy and mechanics in Europe throughout the Mediaeval Ages. One of the most remarkable of those men who, in an age definitely opposed to the scientific spirit, succeeded in carrying on some investigations, was Roger Bacon, 1214-1292. This man anticipated in many ways the method which, later, was to lead men on to further discoveries, but his work was neither understood nor appreciated. Ecclesiastical authority and undue reverence for the past could not so soon be overcome. But, with the Fall of Constantinople in 1453, came the Revival of Learning and the introduction of the investigations of the Arabs who, represented by such men as Alhazen, Avicenna and Averroes, had done much to keep alive a scientific spirit in this Mediaeval period. And this was not all, for there were taking place other events which were simply revolutionising the ideas of men. The discovery of America and the Indies, the invention of printing, of gunpowder, of the telescope and compass opened up vast and hitherto undreamed of possibilities. Added to these discoveries and inventions were the altered political conditions, which meant, in many cases, national independence and freedom. A new inspiration had come to men, a new epoch of civilization seemed to be opened. Before this, the spirit of man had been too much "cribbed, cabined and confined" by the implicit obedience to its dogmas required by the Church and by the unquestioning reliance upon the teaching of Aristotle. The attitude is shown very well in that well-known story about one of the lone investigators, who

thought he had discovered spots on the sun. He was assured though, that, since Aristotle did not mention such spots, the spots he had seen must be in his own eyes. But now things were changed. Theology might continue its chosen way, philosophy, too, might follow its old method, but the special sciences were starting out upon a voyage of discovery, which, in due time, would produce a new temper both in philosophy and theology. What wonder if, for a time, men were carried away by their intense excitement! Nothing seemed impossible any more; the mysteries of the heavens and the powers of the earth will obey the investigator. Science, with its new method, will be the guide of the human mind in its victorious march through nature. There are many illustrious names throughout this period of marvellous development. Telesius, Ramus, Bruno, Campanella are among the pioneer theoretical innovators, while among the more practical reformers are Leonardo da Vinci, Tycho Brahe, Copernicus, Kepler, Galilei, Harvey, and, later, Boyle and Newton.

But many there were, who looked askance at these brave but bold investigations into the innermost truths of nature. And, as different men here and there continued their work along the lines of this new method, this feeling of suspicion grew from one of secret and silent opposition to one of open and bitter hostility. The conflict waxed hot and continued for long. In the year 1660, a number of "divers worthy persons, inquisitive into natural philosophy and other parts of human learning, and particularly of what hath been called the New Philosophy or Experimental Philosophy," formed themselves into a society, and nothing reveals so well this spirit of opposition, as the records that remain of the attacks made upon this little company, which was to become known to history as "The Royal Society". Here were men, who were disregarding the sanctity of Nature's temple, who ruthlessly entered her courts and essayed to bring to light her innermost treasures, men, who would enter even her holy of holies and who would attempt to ascertain her most sacred, her most inviolable laws! A reference to Boyle's "Free Inquiry into the Vulgar Notion of Nature" reveals the superstitious awe with which most regarded Nature in his day; but this new attitude, with its new method, was directly opposed to all such views. Nothing would deter it from investigation and

examination to the very last possibility, and so it was that men, who were filled with this spirit of inquiry, took the conventional current beliefs of their fellows and, like Socrates of old, subjected them to close and accurate analysis. But their method led them further than this. It was not destructive only. Time and labour were expended without ceasing upon the problems that now presented themselves, and the arduous work that was undertaken was not without its reward.

What matter if ridicule was poured upon them, what matter if contempt and invective were hurled against them, what matter if their labours were condemned by many as sheer waste of time and energy! They were building upon a foundation of fact which, they firmly believed, was not to be a foundation upon the shifting sand of assumption, but upon which a future science was to rest safely and securely. "The philosophy, I recommend", said Robert Boyle, "is much more difficult, laborious and expensive than that of Aristotle and the schools, but," he continues in language becoming a noble yet humble man, "I am content provided experimental knowledge be really promoted, to contribute to the meanest way to advance it and had rather be an underbuilder and even dig in the quarry for materials towards so useful a structure than not assist in erecting it." The inscription, which one might well place upon the corner-stone of the great building, the foundation of which such men as Boyle were laying, is splendidly expressed by the great poet:

> "Not clinging to some ancient saw;
> Not mastered by some modern term;
> Not swift nor slow to change, but firm:
> And in its season bring the law."

A further glimpse into this interesting and important period in the history of science and philosophy may be had by turning to the works of the literary writers of the day. In Gulliver's "Voyage to Laputa",[1] Swift has given us an inimitable piece of satire upon the work of the Royal Society. Gulliver is introduced into the learned academy of Lagado. There he finds the natural philosophers all busy with projects and all honoured by the dignified title of projectors. One has been for eight years engaged on a project for

[1] Gulliver's Travels, Pt. III, Ch. 5 and 6.

extracting sunbeams out of cucumbers, and placing them in hermetically sealed vials, in order to let them out in raw, inclement weather. Other projects were the softening of marble into pillows and pincushions, petrifying the hoofs of a living horse to preserve them from foundering, whilst a famous project was that of a most ingenious architect for building houses by beginning at the roof and working downwards to the foundation. Likewise Goldsmith, who depicts the opinion of a certain town, visited by his Citizen of the World, in the following letter, written to Fum Hoan, first president of the Ceremonial Academy at Pekin: "I am amused, my dear Fum, with the labours of the learned here. One shall write you a whole folio on the dissection of a caterpillar. Another shall swell his works with a description of the plumage on the wing of a butterfly; a third shall see a little world on a peach leaf, and publish a book to describe what his readers might see more clearly in two minutes only by being furnished with eyes and a microscope. Yet, believe me, my friend, ridiculous as these men are to the world, they set up as objects of esteem for each other. They have particular places appointed for their meetings, in which one shows his cockle-shell and is praised by all the society, another produces his powder, makes some experiments that result in nothing, and comes off with admiration and applause; a third comes out with the important discovery of some new process in the skeleton of a mole, and is set down as the accurate and sensible; whilst one, still more fortunate than the rest, by pickling, potting and preserving monsters, rises into unbounded reputation.

The labours of such men, instead of being calculated to amuse the public, are laid out only in diverting each other. The world becomes very little the better or wiser, for knowing what is the peculiar food of an insect that is itself the food of another, which in its turn is eaten by a third; but there are men who have studied themselves into a habit of investigating and admiring such minutiae. To these, such objects are pleasing."[1]

The men who belong to this new movement called themselves students of natural philosophy, using the phrase in its general sense as equivalent to a science of nature. With philosophy, which, as a final task, endeavours to form a world-theory, they were not con-

[1] Letter LXXXIX.

cerned. They were engaged with the special natural sciences and held aloof from πρωτη φιλοσοφια, to use Aristotle's phrase, or metaphysics or philosophy, as the word has been employed in the foregoing chapters. And for long they had reason for such aloofness, for, just as theology had directed philosophy and the sciences into barren and fruitless lands, so philosophy itself, liberated from the bondage of theology, but in slavery again to Aristotle had failed to be of any genuine assistance to the special sciences and had, by its insistence upon the purely deductive method, hindered progress and discovery. The enfranchisement, however, of the special sciences and their remarkable success could not but have an effect upon philosophic speculation, and, in succeeding history, this is to be seen quite clearly. Yet that effect was only partial. It was evident, however, upon both the so-called Empiricistic tendency, and the so-called Rationalistic philosophy. The development of each of these and the irreconcilability of their conclusions made possible and necessary the work of Kant, who, in his Critical Philosophy, by attempting to show the fallacies, at once, of Empiricism and Rationalism, pointed to a more adequate solution of the world-problem.

## CHAPTER V.

### Empiricism.

The success which the special sciences were experiencing in this period just described was due to the method which they employed. Had theology and philosophy been able to use that same method, they, too, would have been truly sciences and would have enjoyed greater confidence and more rapid development. As it was, theology held itself sternly aloof from the innovations introduced round about it, and philosophy, as a theory of the universe, only gradually realized the value of the new method. Perhaps no man, in the earlier period, appreciated so well the nature and character of the scientific development as did Thomas Hobbes. He was able to read with splendid accuracy the signs of the times and discerned remarkably well the dual aspect of the method which science was employing. Before outlining what Hobbes conceived this to be, mention, perhaps, should be made of the personage, who often in history has overshadowed the much more brilliant Hobbes, viz., the Lord Chancellor, Francis Bacon.

Credit is frequently given, even yet, to Bacon for having understood clearly the fallacy of the old procedure, which dominated the Mediæval Ages, and for having enunciated the new method. But such a conclusion is incorrect. Bacon did emphasize the necessity for a different method, but he gave voice to the sentiments which were already prevalent, and when he attempted to give a logical account of the new method actually in use,—for that was his work and not the inauguration of this new method,—he failed most signally. It was not the method which Bacon called Induction by which science was advancing and by which it was still to advance. This has been for long recognized. But there was another serious error which Bacon made, and one for which he cannot be so severely blamed. It was a natural outcome of the history of the Mediæval Ages, and Hobbes, too, made the same mistake,—a mistake which, indeed, is only too prevalent at this very day. Bacon completely separated the domains of faith and of reason. If the two conflict,

there is no cause for alarm, the spheres of theology and science are utterly disparate. This view of things, which has done untold harm in the history of thought, is exhibited very nicely in the encyclopædic survey, which Bacon gives in his so-called Intellectual Globe. He outlines a classification of the sciences very comprehensive but singularly defective in its basis, reverting, as it does, to the old notion of the faculties of the mind. This was the theoretic tripartite division of the human soul into memory, imagination and reason. Corresponding to reason there is philosophy or science, with a therefold division, the philosophy of God, of Nature, and of Man. The first, however, the philosophy of God, must content itself with the refutation of atheistic arguments only, because, in revealed theology, man has been given the dogmas necessary for his salvation and these are a matter of faith and not of knowledge.

Hobbes follows Bacon in this regard,[1] differing from him, however, in nearly every other important respect. Particularly are his observations upon the method of science different from those of the Lord Chancellor, and they are much more in line with the actual processes of the sciences. On his third visit to Paris in 1631, Hobbes came into intimate friendship with Gassendi, Mersenne, and Des Cartes. The most important result of the visit was the influence exerted upon him by the geometrical method. Here was a method which led to conclusions of apparently undeniable validity. Hobbes was enthusiastic. He came back to England, determined to apply this geometrical method to other fields of investigation. Thus he hoped to be able to achieve permanent and indisputable results. Now Hobbes saw that the method geometry was using was different from the processes of scholastic, syllogistic deduction. By the new method one obtained new knowledge; he was able to advance. This geometrical method Hobbes saw to be synthetic as well as analytic, and these characteristics, he held, are the essential ones of all scientific method. And Hobbes was right, though, to be sure, he did not fully realize the significance of synthes s in scientific procedures. In the sixth chapter of his De Corpore and the first paragraph, Hobbes says as follows:—"Philosophy (or science, for he uses the word, philosophy, in its generic sense) is the knowledge we acquire, by true ratiocination of appearances, or

[1] De Corpore, Ch. I, Par. 8.

apparent effects, from the knowledge we have of some possible production or generation of the same; and of such production, as has been or may be, from the knowledge we have of the effects. Method, therefore, in the study of philosophy, is the shortest way of finding out effects by their known causes or of causes by their known effects. . . . The first beginnings, therefore, of knowledge are the phantasms of sense and imagination; and that there be such phantasms of sense and imagination we know well enough by nature; but to know why they be or from what causes they proceed, is the work of ratiocination; which consists in composition and division or resolution. There is therefore no method by which we find out the causes of things, but is either compositive or resolutive, or partly compositive and partly resolutive, and the resolutive is commonly called analytical method, as the compositive is called synthetical." The fourth, fifth, and sixth paragraphs of the same chapter illustrate what Hobbes meant by this two-fold method. Seeing that universal things are contained in the nature of singular things, the knowledge of them is to be acquired by resolution. For example, a square is a singular thing which may be resolved or analysed into a plane, terminated with a certain number of equal and straight lines and right angles. By such a resolution, he says, there is obtained a number of things universal to all matter, viz., line, plane, terminated, angle, straightness, rectitude and equality. Or again take the individual thing gold. Resolution or analysis gives one such concepts as solid, visible, heavy and many others more universal than gold itself. These may again be resolved till one arrives at such things as are most universal. "And in this manner, by resolving continually, we may come to know what those things are, whose causes being first known severally, and afterwards compounded, bring us to the knowledge of singular things. I conclude, therefore, that the method of attaining to the universal knowledge of things is purely analytical."[1] But these universals, having been discovered and defined, then comes the compositive or synthetic work of science. To quote Hobbes verbatim, "we are to observe what effect a body moved produceth, when we consider nothing in it besides its motion; and we see presently that this makes a line or length; next, what the motion of a long body pro-

[1] Op. Cit. Ch. VI, Par. 4.

duces, which we find to be superficies; and so forward, till we see what the effects of simple motion are; and then, in like manner, we are to observe what proceeds from the addition, multiplication, subtraction and division of these motions and what effects, what figures, and what properties they produce; from which kind of contemplation sprung that part of philosophy which is called geometry."[1] After the consideration of what results from simple motions, science passes to consider the effects of one moving body upon another, and, likewise, such effects as result from the motion of the parts of any one body. These two latter investigations Hobbes subsumes under the name physics. The internal movements of the human body result in ensible qualities such as light, colour, sound, odour, etc., but these are appearances only, and, in reality, are motions. To quote Hobbes again, "whatsoever accidents or qualties our senses make us think there be in the world, they be not there, but are seeming and apparitions only: the things that really are in the world without us are those motions by which these seemings are caused."[2] After physics, comes civil and moral philosophy wherein are considered the "motions of the mind".

The above outline of the general position of Thomas Hobbes serves a double purpose. It reveals his conception of the scientific method of his day, as well as showing the great m stake into which Hobbes fell. The latter consisted in this: he was so nfluenced by the developments in the special sciences as introduced to him by Copernicus, Kepler and Galilei, and by the revolutionary work of Harvey n physiology, that his own science and h s own philosophy or world-theory are definitely constructed thereon. Hobbe was right in taking cognizance of the wonderful results of the sc ences, but he was wrong in suggesting a world-theory wh ch was biassed by those results to such an extent that other facts, just as important and just as obvious, were by him denied or relegated to the realm of appearance and illusion. And yet, as one criticises Hobbes' work, he is still filled with admiration for the man who conceived such a world-scheme and carried it out so fearlessly and consistently. Hobbes supposed that "the first beginnings of knowledge are the phantasms of sense and imagination . . . that there be such phan-

[1] Op. Cit. Ch. VI, Par. 6.
[2] Human Nature Ch. II, Par. 10.

tasms we know well enough by nature", but he was led to neglect, if not to despise the steps by which he had ascended, and he was induced to predicate as the universal cause of all th ngs, motion, the truth of which predication was in his eyes "known to nature", known by the "natural light", self-evident, axiomatic.[1] But this error of Hobbes, one which, by the way, has been made over and over again, may be more readily overlooked, when one remembers the keen and careful account which he gives of the method of science.

Science, as defined above in chapter two, is the description and explanation of facts obtained by observation and experiment. In the performance of its work, science constantly uses analysis. It is by means of analysis that description is made, for, in that way, men obtain the constituents of their different sciences, with the help of which they describe the complex facts which are presented. Moreover, had it not been for this analytic method, there could have been no differentiation into the special sciences without which no advance would have been made. But not only is the scientific method analytic, it is also synthetic. As man experiments, whether in geometry, to use Hobbes' illustration, or in those other sciences where experiment has played such an important part,—as man experiments, new complexes are constantly arising; the body of data to be described and explained is constantly growing. Now it is this aspect of experience, which, apparently, impressed Hobbes. Because the geometrician produces certain effects, geometrical figures, by the operation of certain causes, specific motions, which effects have new properties, geometry is synthetic. It is quite right to recognize such a characteristic running throughout all science, but it must also be agreed that the same characteristic is evident in ordinary experience as well as in science. A complex is always more than the mere sum of its constituents. This law of Psychical Resultants, to use a psychological term, is everywhere operative, and, for that reason, it helps little, in estimating the method of science, to call it synthetic in that sense. Yet Hobbes accomplished much by showing that the scientific method is not merely analytic. Had he paid more attention to the work of the different sciences of his day he would have seen that his view of synthesis was only a part-truth.

[1] Cf. De Corpore Ch. VI Par. 5.

The synthetic procedure, which is employed to such an extent by the scientist and which is peculiarly his, is illustrated well by the work, say, of Darwin. Darwin had before him certain phenomena, which were the result of artificial selection and breeding. Might not such a process, he argued, have been going on for millenia on a much wider scale, in nature? But, first, there must be something to take the place, in this long natural history, of the hand of man, as evidenced in the artificial selection. Malthus, working in a more limited realm, gave him the suggestion in the economic phrase, the survival of the fittest. Thus, led by that wonderful promoter of discovery,—the "disciplined imagination", to use Karl Pearson's phrase,—Darwin was able to connect up a small body of observed fact with a larger body of data. Here, there is illustrated a process of synthesis, the net result of which was the Theory of Evolution. Numerous illustrations of a similar character might be drawn from the sciences of anthropology, astronomy, physiology and physics. Such a synthetic method is of the highest value, and none the less so, because the conclusions or theories that result are not always capable of experimental verification. Of course Hobbes knew nothing of Darwin's "Origin of Species", but the theory of evolution has only been used above as a good illustration. In the work of his predecessors and contemporaries, in the experiments, say, of Galilei, as he endeavoured to formulate the law of falling bodies, there were examples of just such a method being employed.

This synthetic aspect of the method of science is illustrated also by such work as that of Newton, for example, who was able to coordinate into one general formula, the law of gravitation, the uniform movements of all bodies, howsoever diverse, found within the solar system. Here again, there is a linking up of different bodies of data, and when men, at different times, have sought to express all the phenomena, say, of light,—its intensity, velocity, reflection, refraction, etc.,—by one general theory, or when the theory of light, the theory of electricity, the theory of heat are all united under one conception, there, too, are illustrations, in an even wider sense, of the operations of synthesis in the working of the sciences. Analysis and synthesis constitute then the method, which science uses in its description and explanation of facts, and

to Hobbes must be given the credit of seeing clearly the nature and necessity of analysis and of suggesting though not fully appreciating the nature and equal, or even greater necessity of synthesis.

It has already been seen that the mechanistic views advanced by Hobbes were the result of the influence of the special sciences of his day. That motion is the universal cause of all things, was, apparently, for him a self-evident truth. But that motion is the universal cause of all things did not appear to some to be so self-evident. There seemed, at any rate, to be certain facts which were more obviously known than this conclusion. And, in the years succeeding Hobbes' work, discussion centred around the problem of knowledge. Indeed, from Hobbes until Kant, the great problem with which philosophy was concerned was just this problem of knowledge, and here again the real function of philosophy sank into the background. Theories of knowledge, strictly speaking, find a more proper place in the history of psychology than in the history of philosophy, and it is only because, at this time, psychology, as a science, had not become separated out from philosophic investigation and speculation, that Empiricism and Rationalism, as theories of knowledge, deserve to be included in the history of the philosophy of this period. Hobbes had laid emphasis upon the "phantasms of sense and imagination", which, he had said, were the first beginnings of knowledge; but he likewise had made frequent use of ratiocination or reasoning. This latter, he saw, was extremely important. Without it, science was impossible, for the method of science consisted in just such ratiocination. The distinction between the schools that now arose lies mainly in the emphasis which was placed upon sensation and reason as factors of knowledge.

English Empiricism was impressed by the development taking place in the natural sciences. Its aim was to discover the actual facts of experience. But there was a growing tendency to interpret experience as sense experience only. Rationalism, on the other hand, cared little for the mere facts of sensation, and emphasized reason as the enunciator of general principles universally valid. The two schools developed side by side, their conclusions growing more and more at variance, until, with Hume, on one hand, and Leibniz and Wolff, on the other, there arose a state of affairs which seemed

hopelessly contradictory. Then it was that Kant brought forward his critiques, in which, by means of a more adequate method, he was able to suggest both the fallacy and the truth of the two opposing schools. Before, however, considering the validity of the attempt at reconciliation which Kant made, it will be well to follow out the thread of English Empiricism to its ultimate conclusions, to see how significant was the result attained by this standpoint.

John Locke, the successor in England of Thomas Hobbes, may be regarded as the formulator of English Empiricism. Perplexed by certain difficulties in the domain of religious beliefs, Locke found it necessary, as he thought, to make an examination into the human understanding in order to discover with what objects it is fitted to deal. His book "On the Human Understanding" is the result, the purpose of which is "to inquire into the original, certainty, and extent of human knowledge together with the grounds and degrees of belief, opinion, and assent."[1] In pursuing this task, he follows a threefold method[2]; first, he inquires into the origin of ideas, meaning thereby "the notions or whatever else you please to call them, which a man observes and is conscious to himself he has in his mind"; and the ways whereby the understanding comes to be furnished with them. Secondly, he endeavours to show what is the certainty, evidence, and extent of the knowledge so obtained, and thirdly, he makes some inquiries into the nature and grounds of faith or opinion. Whence comes the mind then to be furnished with its ideas? Whence has it all the materials of reason and knowledge? To these questions Locke gives the answer, from experience. In that, all our knowledge is founded and from that it "ultimately derives itself". "Our observation, employed either about external, sensible objects or about the internal operation of our minds, perceived and reflected on by ourselves, is that which supplies our understandings with all the materials of thinking."[3] In experience, then, there are two kinds of simple ideas; these he calls ideas of sensation and ideas of reflection. To express it in the rather crude language of Locke, the senses convey into the mind from external objects simple ideas which may be compounded by the mind into complex ideas. On the other hand, when the mind "turns its view

[1] Op. Cit. Book I, Ch. I, Par. 2.
[2] Ibid., Par. 3.
[3] Book II, Ch. 1, Par. 2.

inward upon itself and observes its own actions about those ideas it has from sense",[1] there arise ideas of reflection, such as those of perception and willing.

Admirable as were the method and aim with which Locke commenced, he did not succeed in advancing far without finding himself in inextricable difficulties. In trying to arrive at the actual facts of experience he made certain presuppositions such as those of external object, mind and the object producing in us simple ideas. And these assumptions, coming at the first of his work, were bound to lead to difficulties, and an outstanding example of these is seen in the following. In the eighth chapter of the second book, Locke makes a distinction between primary and secondary qualities. The latter are colours, sounds, tastes, etc., and "are nothing in the objects themselves but powers to produce various sensations in us by their primary qualities".[2] The primary qualities, however, are such as are utterly inseparable from every particle of perceived or unperceived[3] matter. These qualities are solidity, extension, movement, which, Locke claims, "do really exist in the bodies themselves",[4] the ideas which we have of them being resemblances only, whereas the secondary qualities, which are in us, are not resemblances at all, being in the bodies only a power to produce those sensations. Now, when Locke endeavours in the fourth book to prove the knowledge of particular existences or objects, he reaps the results of the presuppositions made in the earlier part of his work. Sensitive knowledge, or knowledge of objects, he is led to confess, is the least clear and certain of the three degrees of knowledge.[5] Having assumed that there are objects outside experience in which reside certain primary qualities, and, having claimed that all knowledge is derived from experience, it became utterly impossible to prove that we know such external objects. By his very definition they were placed outside the realm of knowledge. Indeed, Locke had no right even to say that our ideas of the primary qualities resemble the primary qualities,[6] for to predicate resemblance of any two sets of data implies that both are in experience. Further, even at the expense of being charged with punctiliousness, one might

[1] Book II, Ch. 6, Par. 1.
[2] Book II, Ch. 8, Par. 10.
[3] Cf. Book II, Ch. 8, Pars. 9 and 13.
[4] Book II, Ch. 8, Par. 15.
[5] Book IV, Ch. 2, Par. 14.
[6] Book II, Ch. 8, Par. 15.

point out that, since perception is the operation of the mind about ideas, there can be no perception of "matter" as having any properties. By his own assumption, Locke's lips were closed, and, yet, he endeavoured, inconsistent though the attempt was, to prove a knowledge of external objects.

Thus, interestingly enough, we have arrived at the point in the development of so-called theories of knowledge from the standpoint of empirico-physical science, when the "idea" has become entirely divorced from the object which is supposed to be its cause. The naive man unwittingly holds that he has direct experience of sticks and stones—objects of nature; but we are here told that the naive man is mistaken, he only knows ideas, and the utmost that he can expect is a correspondence between his ideas and natural objects. But, since correspondence is likewise a relation to be perceived by the mind and therefore must again be between ideas, it is evident that of a relation of correspondence between an idea and an extra-mental object he knows nothing.

This is the penalty theory of knowledge has to pay when it adopts a view of the world based upon a physical standpoint like that of Galilei, Gassendi and their contemporaries and successors. Assuming the world to consist of matter and motion, the attempt has been made to construe all the furniture of the mind in terms thereof (Hobbes), or as products thereof (Locke), with the curious result that our *theory* of knowledge leaves us *toto caelo* removed from the very objects with which science itself claims to deal. All the attempts of Locke to urge upon us, "resemblance", and that the objects can be demonstrated, leave us in the same hopeless plight, since resemblance and demonstration consist in the relation of ideas. The objects of nature are forever transcendent and of transcendent objects no science can be made. Whether, therefore, these accounts of the originals of our knowledge are adequate to the actual operations of science is a question which must give us serious pause. It is easy for criticism of to-day to call attention to the inconsistency of Locke, but it is not so easy, perhaps, to recognize the real problem which lay at the basis of his illogical procedure. That there was such a problem the subsequent history of English Empiricism was to show, but, first, the logic of Locke's starting-point was to work itself out to thoroughly consistent conclusions and in Berkeley and Hume this process took place.

Locke, in the twenty-third chapter of his second book, had attacked the traditional notion of substance, and had gone so far as to say that no one has any idea of pure substance in general other than a "supposition of he knows not what support of such qualities which are capable of producing simple ideas in us".[1] Berkeley unhesitatingly affirms that there is no knowledge whatsoever of matter as such a pure substance. Matter is one of those abstract ideas, which ideas, accordingly to Berkeley, have rendered speculation intricate and perplexed and occasioned innumerable errors and difficulties. But, if there is no knowledge of matter in general, neither is there any knowledge of particular bodies supposedly composed of such matter. The objects of human knowledge are ideas, simple or complex, and when "several of these are observed to accompany each other they come to be marked by one name and so to be reputed as one thing".[2] It is, however, says Berkeley, an opinion strangely prevailing among men, that houses, mountains, rivers, and, in a word, all sensible objects have an existence, natural or real, distinct from their being perceived by the understanding; but such an opinion involves a manifest contradiction, for all these objects are things we perceive by sense and we perceive nothing but our ideas or sensations, and it is plainly repugnant that any one of these, or any combination of them should exist unperceived.[3] Here is contained the kernel of Berkeley's teaching which may be expressed in his own phrase "esse est percipi".

"All the choir of heaven and furniture of the earth, in a word, all those bodies which compose the mighty frame of the world, have not any substance without a mind, . . . their being is to be perceived or known, . . . so long as they are not actually perceived by me, or do not exist in my mind or that of any other created spirit, they must either have no existence at all or else subsist in the mind of some Eternal Spirit."[4] Berkeley goes on to say[5], that Locke was right in claiming that the secondary qualities exist only in us, but wrong in permitting to so-called primary qualities an existence external to mind. If bodies themselves exist only in

[1] Op. Cit. Par. 2.
[2] Rationale of the Principles, Par. 1.
[3] Ibid., Cf. Par. 4.
[4] Ibid., Par. 6.
[5] Ibid., Cf. Pars. 9 and 10.

being perceived, then, of course, solidity, extension, movement, can have no existence apart from perception, and the distinction between primary and secondary qualities breaks down. If it be objected that in calling all things ideas, Berkeley is destroying the reality and substantiality of nature, he answers,—not so. Whatever we see, feel, hear, or any wise conceive or understand, remains as secure as ever and is as real as ever. To apply the word, idea, to that which we eat and to that with which we are clothed, in no way alters these, and, if it were not for the traditionary use of the word, thing, as denoting something existing without the mind, the same word, thing, might still be retained and applied. The objects of science, on such a view, are not transcendent objects, as they must be on Locke's view. Science is concerned, Berkeley would hold, with ideas or things which are known. Another objection might be urged against this "idealistic theory", viz., that since objects exist only when they are perceived, therefore, at almost every moment, they must be annihilated and created anew; the trees in the garden, the chairs in the parlour, are no longer existent when there is no individual to perceive them. But Berkeley does not hold any such view. He believes that trees and chairs have an existence apart from his own particular mind, apart, indeed, from all finite minds, but this apparently independent existence is not an existence apart from mind after all, for the world of nature exists, then, he believes in the mind of God. To be is to be perceived. There is no existence apart from perceiving spirit, though that spirit may be finite or infinite.

To the teaching of Berkeley, as outlined above, modern philosophy and modern psychology are greatly indebted. And yet Berkeley is not without his mistakes, though the one that is most commonly urged against him does not seem to be at all well-substantiated. Locke held explicitly that simple ideas come into the mind and are then compounded by it into complex ideas. That Berkeley and Hume, likewise, accepted the simple-idea theory of Locke has generally been supposed, but a careful reading of each by no means bears out any such criticism. They both classify ideas into simple and complex, but nowhere do they say that simple ideas enter the mind and are afterwards combined into complex ideas. Berkeley clearly holds no such doctrine. He says in the

very introduction to his principles, "It is agreed on all hands that the qualities or modes of things do never really exist each of them apart by itself, and separated from all others, but are mixed, as it were, and blended together, several in the same object"[1]; and again in the same paragraph, "there is perceived by sight an object extended, coloured and moved". Words could hardly be plainer in denying that there are given to the mind simple ideas, which are by it combined. His whole argument against the possibility of perceiving abstract ideas, including, of course, the abstract ideas of qualities, serves only to substantiate this interpretation of Berkeley's words. That Hume held a similar doctrine can hardly be doubted[2] and, until those who think otherwise are better able to support their theory from the writings of the men themselves, we prefer to accept the above interpretation, believing it to be more in accord with the facts of the case. Even if it were granted that Berkeley and Hume did not fully realize that particular objects or things are themselves, like the simple ideas, results of abstraction from the given whole of experience, yet such a mistake on their part would not leave them open to the criticism referred to above, viz., that they, like Locke, committed the simple-idea error.

But Berkeley did make the mistake however of assuming that ideas, though not given to the mind simple and uncompounded, are dependent upon a spirit, in which they subsist. For he says that ideas are "inert, fleeting or dependent beings, which subsist not by themselves, but are supported by, or exist in, minds or spiritual substances".[3] Hume, however, saw no reason for assuming the dependence of ideas upon an immaterial substance. The very arguments Berkeley used to disprove a material substance, Hume claimed, disprove also an immaterial substance. Since matter is not perceived, for, if it were, it would be an idea, it is therefore nonexistent; similarly, since spirit is not perceived, it likewise is nonexistent. This argument of Hume is especially cogent on account of the manner in which Berkeley had given an account of the perceiving spirit for, having identified existence with perceived things, that is ideas, spirit was not among any of the ideas and therefore lay outside the realm of existence. There are in the understanding

[1] Par. 7.
[2] Cf. A Treatise of Human Nature, Book I, Part 1, Sec. 7.
[3] Consequences of the Principles, Par. 89.

ideas only, or, rather, to use Hume's own terminology, there are impressions and ideas. Impressions denote the data received through sense, including, however, pains and pleasures, and the ideas are the faint images of impressions which arise in thinking and reasoning. All knowledge is originally derived through sense.[1] The soul is not an immaterial substance but a bundle of perceptions. Hume fearlessly and consistently applied his argument not only to substance but also to certain other principles, chief of which was causality, and, in holding that causality is a relation among ideas and that the necessity usually attributed to it is due only to constant conjunction and habitual or customary association of ideas, he came into direct opposition with the rationalistic philosophy which had been developing on the continent, and was contemporaneous also with him in England, and which held to a universality and necessity in experience other than that which Hume conceded. In his unambiguous statement that "the independent existence of our sensible perceptions is contrary to the plainest experience",[2] Hume is quite at one with Berkeley. But since, unlike Berkeley, Hume did not hold to the necessity of a perceiving spirit, one might be led to suppose that he would deny existence to unperceived objects or things; but this is just what Hume does not. He holds firmly to a belief in, though no knowledge of, a continued existence. Referring to the popular but false view that perceptions continue to exist, he says, "The imagination naturally runs on in this train of thinking. Our perceptions are our only objects; resembling perceptions are the same, however broken or uninterrupted in their appearance: this appearing interruption is contrary to the identity: the interruption consequently extends not beyond the appearance, and the perception or object really continues to exist, even when absent from us; our sensible perceptions have, therefore, a continued and uninterrupted existence. But as a little reflection destroys this conclusion, that our perceptions have a continued existence, by showing that they have a dependent one, it would naturally be expected that we must altogether reject the opinion that there is such a thing in nature as a continued existence, which is preserved even when it no longer appears to the senses. The case, however, is otherwise." And then Hume goes on to say,

[1] Cf. A Treatise of Human Nature, Book I, Part 2, Sec. 1.
[2] A Treatise of Human Nature, Book I, Part 4, Sec. 2. (P. 210 Selby-Bigge's Edn.).

"Philosophers are so far from rejecting the opinion of a continued existence upon rejecting that of the independence and continuance of our sensible perceptions, that though all sects agree in the latter sentiment, the former, which is, in a manner, its necessary consequence, has been peculiar to a few extravagant sceptics; who after all maintained that opinion in words only, and were never able to bring themselves sincerely to believe it".[1] The belief in an independent and continued existence is one that has taken such deep root "that it is impossible", Hume declares, "ever to eradicate it, nor will any strained metaphysical conviction of the dependence of our perceptions be sufficient for that purpose".[2] All that reason can do is to ascertain what causes induce us to believe in the existence of body; that we do entertain such a belief is for Hume an undeniable fact.

Now it has been shown above that John Locke commenced his investigations into the human understanding with a similar belief. That Berkeley, too, held to a continuous existence independent of finite minds is demonstrated by his doctrine of the Eternal Spirit. But Locke tried to do two things each of which was impossible. He tried to prove knowledge of these independent existents and he tried likewise to make them the cause of the actually known or perceived facts. Hume, with clearer understanding, saw the futility and impossibility of both these attempts. That which is posited as outside experience[3] cannot, at the same time, be within experience; that which is believed cannot, at the same time, be known. And since causality is a relation only among impressions and ideas, it cannot be predicated as a relation between "thing" or "object" and perception. "The only existences, of which we are certain, are perceptions. . . . As no beings are ever present to the mind but perception, it follows that we may observe a conjunction or a relation of cause and effect between different perceptions, but can never observe it between perceptions and objects. 'Tis impossible, therefore, that from the existence or any of the qualities of the former, we can ever form any conclusion concerning the existence of the latter, or ever satisfy our reason in this particular."[4] No causal relation can be predicated between the known and the unknown. We are left, then, with no knowledge of but a belief in,—

[1] Selby-Bigge's Edn. Pp. 213-4.
[2] Ibid. P. 214.
[3] The word, experience, is used here of course in the sense then given to it.
[4] Selby-Bigge's Edn. P. 212.

an ineradicable belief in the existence of objects apart from perception. Here, in Hume, is a doctrine of knowledge by which, evidently, Kant was greatly influenced. The great English thinker and the great German thinker, generally supposed to be so much at variance, are, at this important point and in many others as well, quite in agreement. But the wonderful significance of Hume's position for philosophy and science and religion was not appreciated by the English and Scotch thinkers who succeeded him. His influence upon empirical psychology in England was, however, enduring and lasting, but to men like Reid and Stewart the great task and duty of philosophy were to refute in the supposed interest of commonsense and morals the "sceptical" arguments of David Hume. That they failed is due to two reasons; first, they did not understand Hume's so-called scepticism, and secondly, they failed critically to consider their own presuppositions.

This final conclusion of the English empirical standpoint of Hobbes and Locke, a standpoint taken from the tremendous movement of natural science just preceding and contemporaneous with them, became now in the hands of Hume reduced to its ultimate logical result. And, no doubt, the import of such an examination of the empirical Theory of Knowledge was far-reaching enough to be revolutionary in the current conceptions of morals and religion. The implication of such an issue, especially for religion, whether natural or revealed, did not escape the keen eye of Hume, as his analysis of the data of morals and religion shows. But the very thing which Empiricism had shown to be unknown was claimed by the rationalists not only to be known but to be most surely known, for the operations of Reason were supposed to have a far greater certainty than the operations of mere sense. Thus the world of science and philosophy, represented by Empiricism and Rationalism, became divided into two utterly hostile camps. Thus arose the necessity for a critical examination of the claims of both. Such examination has been styled the Critical philosophy, of which Immanuel Kant is supposed to have been the first great modern representative. But whether Kant has really answered the position of Hume we must now endeavour to investigate. In order to do that, however, it will be necessary first to trace, briefly, the development of Rationalism, prior to Kant, through its main advocates Des Cartes, Spinoza, Leibnitz and Wolff.

## CHAPTER VI.

### Rationalism.

The characteristic feature of Empiricism is the important function assigned by it to sense-experience, from which source, it held, all knowledge is originally derived. But there were some who were not content thus to limit knowledge in its origin. There are other factors in experience, it was claimed, the origin of which is "Reason". Reason supplements with higher and truer knowledge the empirical facts given in sense. The men who are representative of this latter view were Des Cartes, Spinoza, Leibnitz and Wolff. The two former were greatly influenced by the method which mathematics, especially geometry, was using with so much success, and the philosophy of each cannot be understood without bearing this in mind.

Des Cartes was an admirer of Gassendi, Galilei and Newton, and deserves an important place in the history of mathematics and physics as well as in the history of philosophy. His high regard for the method of geometry may be illustrated by the following quotations. He says, "above all I was delighted with the mathematics on account of the certainty and evidence of their demonstrations, but I had not as yet found out their true use, and, although I supposed that they were of service only in the mechanic arts, I was surprised that upon foundations so solid and stable no loftier structure had been raised".[1] And again "those long chains of reasoning quite simple and easy, which geometers are wont to employ in the accomplishment of their most difficult demonstrations, led me to think that everything which might fall under the cognizance of the human mind might be connected together in the same manner".[2]

It becomes the aim of Des Cartes to produce a philosophy the conclusions of which will be just as certain as those of geometry.

[1] Discours de la Méthode, (Torrey's transl.) Pt. I, Par. 10.
[2] Ibid. Pt. 2, Par. 11.

In the "Principles of Philosophy", he has presented his results, and, in his "Meditations", he gives a more detailed account of the means whereby he attained those results. It is well known that Des Cartes, like Augustine many centuries before, commenced with a method of doubt, which, however, was a means only to rid himself of certain opinions he had previously unquestioningly accepted, his final aim being to build upon solid foundations "a firm and abiding superstructure in the sciences".[1] As a result, then, of this method of doubt, Des Cartes finds that there is one thing itself indubitable, viz., the fact that he doubts. Here, in the immediate facts of doubt, Des Cartes finds the foundation upon which he may base his arguments. But Des Cartes misunderstood the significance of his own conclusions. Running throughout the Meditations and becoming quite explicit in the Principles is the unfortunate division he made between matter with its principal attribute of extension, and mind, with its principal attribute of thinking. Having assumed that mind and matter were thus disparate, it became an impossible task to prove knowledge of material objects, and yet this is the attempt to which Des Cartes, like Locke, was unwittingly driven. It was to be only by forsaking the method with which he had commenced and by making certain further dogmatic assumptions that Des Cartes was to bring into any kind of relation the two substances, mind and matter, supposed to be so different. And here it is that his rationalism becomes apparent. The senses alone, Des Cartes affirms, can never give clear and distinct knowledge of external objects. As he himself says, "it is now manifest to me that bodies themselves are not properly perceived by the senses nor by the faculty of imagination but by the intellect alone, . . . they are not perceived because they are seen and touched, but only because they are understood, or rightly comprehended by thought."[2] Furthermore, not even then would there be a sure knowledge of external things, for man would still be liable to err in his judgments, were it not for the fact that there is implanted in him an idea, an innate idea of God, from which Des Cartes proceeds to the proof of His existence. Knowing thus that there is a God, that He is no deceiver and that all things depend on Him, Des Cartes thence infers that all which he clearly and distinctly perceives is neces-

[1] Meditations I, P. 21. The Open Court Edn.
[2] Ibid. P. 41.

sarily true. But such an account of knowledge and such a dualistic view of the world, though for a time it met with immense success, could not remain for long unchallenged. The problem of succeeding thinkers was to centre, mainly, around the relation of mind and matter as defined by Des Cartes.

Of greater importance in regard to this problem than the Occasionalists, Geulinx and Malebranche, was the so-called Materialistic school that arose. La Mattrie, one of the most outspoken of these in France, endeavoured to overcome the dualism of Des Cartes by denying the necessity for any substance called mind. If animals are automata, and Des Cartes had affirmed this, then man, too, may be called a machine, though, to be sure, a very complicated one. This tendency ran a varied course in the teachings of Diderot, Holbach, Helvetius and Cabanis, but the refutation to all such materialism lies in the method which Des Cartes himself had suggested, a method which leads one to see, or should lead one to see the indubitable character and the actual nature of the immediate facts of his experience. A more interesting and important successor of Des Cartes than any of the Occasionalists or Materialists was Spinoza, who endeavoured to overcome the dualism of Des Cartes by working out the logical consequences of his definition of substance, showing that there can really be but one substance. This substance Spinoza called God. It has infinite attributes of which the human intellect knows but two, extension and thought. Matter and mind, then, are not two opposite substances, they are two different ways of conceiving one and the same substance. Particular bodies and particular minds are modes of extension and of thought respectively. This, in brief, is the essence of Spinoza's advance, if advance it be, upon the dualistic position of Des Cartes. He endeavours to follow the method of geometry closely throughout, commencing with certain definitions and axioms, which are, he claims, clear and distinct to the reason. But in the starting point of Spinoza lay his mistake, for his definitions were not matters-of-fact or statements thereof; they were merely verbal, and so, while the dualism of Des Cartes was avoided, not to say overcome, his dogmatism was perpetuated.

The work of Leibnitz, however different in form as well as in matter from that of Spinoza, still illustrates the same rationalistic

tendency evidenced in the latter's appeal to reason. Leibnitz claimed that our reasonings are founded on two great principles, that of contradiction and that of sufficient reason. "There are also two kinds of truths,—those of reasoning and those of fact. Truths of reasoning are necessary and their opposite is impossible; those of fact are contingent, and their opposite is possible."[1] But, though Leibnitz made this distinction in favour of rationalism, yet he held very firmly to what he termed the law of continuity.[2] This belief of his, itself a deduction from his investigations in mathematics, influenced all his thinking. It is seen operating in his Theory of Knowledge. Locke, Leibnitz claimed, was wrong in holding that the mind was originally like a *tabula rasa*. His error, Leibnitz contended, consisted in his overlooking the fact that there are in the mind what Leibnitz called "perceptions petites".[3] These minute perceptions constitute the lowest stage of knowledge. The highest stage of knowledge is that of apperception where ideas are clear and distinct. Moreover, even at the lowest stage, the mind is active, making use involuntarily, instinctively as he claims, of certain principles, which virtually are in the mind always. From these conclusions he argued that *nihil est in intellectu quid non fuerit in sensu, nisi ipse intellectus*. This rationalistic position of Leibnitz, coupled with the influence of the natural science of his day, influenced wonderfully the metaphysical views which he held.

Des Cartes had treated matter as inert and lifeless. Leibnitz claimed that it is the power of resistance that constitutes the essence of matter and the power of resistance is force. This it is which really exists. There are as many simple, indivisible forces as there are things, and these forces he called monads. Corresponding to the different degrees of knowledge, there is a hierarchy of monads culminating with God the perfect monad. Each monad differs from and excludes all the rest. There are no windows by which anything can enter or depart, but each monad in some degree represents or reflects the universe. But the question arises how can all these monads, each unique in itself, become a universe? By means of the hypothesis of pre-established harmony, Leibnitz asserts a unity in a world which otherwise would appear to be composed of atomic individuals.

[1] The Monadology Par. 33.
[2] Cf. Nouveau Essais IV, 16.
[3] Ibid. Preface.

The different writings of Leibnitz do not contain any systematized philosophy. They are, however, especially helpful in suggesting solutions of problems and in presenting half-truths which a later age was to develop more fully. It was Wolff, who, with less insight but a greater love of precise definition and classification, endeavoured to put into a system the results of the Leibnitzian teaching. Wolff became exceedingly popular, partly because he delivered his lectures in the German tongue, and partly because he presented a system which seemed to commend itself at once by its completeness and definite terminology. But his teaching was nevertheless too rationalistic, too dogmatic to satisfy the clearer thinkers of the day, and the opposition to such a standpoint, as evidenced in the empiricism of Hume, led to controversy and antagonism, which, however, became fortunately the prelude to a new era in the history of thought, the era known, generally, as that of the critical philosophy. The work of Wolff is mainly significant for the fact that in the critical discussions of Kant the terminology of Wolff is everywhere applied, and it is the understanding of the classificatory system of Wolff which in large measure gives intelligibility to the argument of Kant.

But before the work of Kant, the great representative of this critical philosophy, is delineated, it will be well to pause here in order to ask wherein lies the exact significance of these theories of knowledge for philosophy as a Weltanschauung or world-view. Though it is true that philosophy does not find its essential task in developing a theory of knowledge, yet it is not, by any means, the case that such theories have no relation to the general view of the world which philosophy aims at constructing. Theories of knowledge have been in the history of thought necessary preparations for views of the world. By means of their theories of knowledge men have been endeavouring to understand the actual processes which constitute all their experience. Such an investigation is a necessary propaedeutic for any comprehensive view of the world, for, without a proper conception of what are the actual determinations of knowledge, no philosophy can hope to be adequate. Empiricism, in approaching this task, was more painstaking and patient than rationalism. The latter seemed anxious to complete its work and tended to leap to conclusions

too rapidly. For that reason, there grew from out the rationalistic tendency a number of philosophic theories which, just because they were not broad-based upon an adequate view of knowledge, a later age was to call dogmatic. Such theories did not take cognizance of all the known facts, being mostly concerned with those regarded as universal and necessary, and, for that reason, were onesided and unsatisfactory.

Among the world-views, which were held in this period, were some which were dominantly theological in their interests. The consequences of such a condition history had already revealed, but here again, in the sixteenth, seventeenth and eighteenth centuries, the mistake was made of subordinating philosophical interests,—interests which should be all inclusive and, therefore, subordinate to none,—to theological speculation. The result, as evidenced in the deistic, theistic, pantheistic and atheistic beliefs of the time, was satisfactory neither to theology nor to philosophy. Again, philosophy, with some, was unduly handicapped by certain scientific theories. On the one hand, there arose and flourished for a time the materialism already mentioned, a materialism which was influenced by the discoveries in physics and physiology, a materialism which made mind, at times, an attribute of matter, at times, an effect of matter, and again, exactly the same as matter, but which never stopped to face honestly the inconsistencies of its too simple philosophy or to ask itself just what mind and matter actually are from the standpoint of content of knowledge. On the other hand, because of the influence of mathematical and mechanical theory upon his general speculations, Leibnitz suggested a philosophy which has generally been termed a monistic spiritualism. All the monads mirror the universe, though not all with an equal degree of clearness. Force he takes to be but another name for self-activity, consciousness, or spirit, and so things, generally regarded as extended and corporeal, are, for Leibnitz, to some degree at least, spirit. Though the Leibnitzian philosophy seems so far removed from that of Des Cartes, who was influenced in his conclusions by both theology and the sciences, yet, after all, it finds its true home in one aspect of his dualism, and the materialism depicted above may likewise trace its origin back to the other aspect of the self-same source.

Resembling somewhat the spiritualism of the Monadology is the teaching of the empiricist, Berkeley. The likeness between the two, however, is superficial and consists mainly in the opposition of each to materialism. As already seen, Berkeley has had great influence in regard to theory of knowledge, but he likewise enunciated a Weltanschauung, and it should not be overlooked that he has wonderfully affected modern philosophy and especially that type known as Idealism. Too frequently, modern writers have taken Berkeley to task for exhibiting what they call a Subjective Idealism. But the function which he assigned to the Eternal Spirit and his belief in the existence of things outside the perception of the individual are clear enough refutations of all ascriptions to him of any such theory. The world of thought owes much to English empiricism, and, though Locke, Berkeley and Hume did not develop philosophical systems to the same extent as did the rationalists, yet they assisted towards the building of a philosophy by emphasizing the necessity of investigating experience as a preliminary to any world-theory. This emphasis upon experience, as well as the emphasis upon the belief in that which transcended experience, was to have its effect, through Kant, upon subsequent thought.

Immanuel Kant was born at Königsberg, Prussia, in 1724. At the age of eight years, he was sent to Frederick's College in his native town. Here under the influence, mainly, of the celebrated Pietist, Schulz, the religious views, inculcated by his mother, were fostered and developed. Then in 1740 Kant entered the University of Königsberg, and there studied philosophy, mathematics and theology. Fifteen years later he commenced to lecture in his home university; in 1770 he was made full professor of logic and metaphysics, which position he held till in 1797 increasing infirmities of age led him to give up lecturing. The uniform course of the great but modest scholar's life was disturbed neither by the brilliancy of the fame that came to him nor by the opposition of theological orthodoxy, exhibited towards him in his closing days. He died in Königsberg in the year 1804.

The writings, by which Kant is best known, are chiefly the three critiques,—the Critique of the Pure Reason published first in 1781 and then in a second edition in 1787, the Critique of the

Practical Reason published in 1788 and the Critique of the Faculty of Judgment written in 1790. In 1766 Kant had published an essay entitled On the Dreams of a Ghost-Seer, as illustrated by the Dreams of Metaphysics, and in 1770 there had come from his pen a Dissertation on the Form and Principles of the Sensible and Intelligible World. These earlier writings foreshadowed, to an extent, the teachings which the critiques embody, but it is in these latter that there are to be found the views which constitute Kant's importance in the history of philosophy.

Reference has already been made to the conditions prevailing in the realm of metaphysics towards the close of the eighteenth century. Kant himself describes the situation in his Critique of Pure Reason. He pictures metaphysics as a queen whose rule has become dogmatic and despotic. Intestine wars, however, and finally complete anarchy break out. Among the rebels are the sceptics, who, like nomads, despise all settled culture of the land and endeavour to prevent others from cultivating the ground afresh. The result of this state of affairs is that "at present, after everything has been tried, as they say, and tried in vain, there reign in philosophy weariness and complete indifferentism".[1] Metaphysics, he says, has hitherto not been so fortunate as to enter on the secure path of a science, and has been for that reason "an arena, specially destined, it would seem, for those who wish to exercise themselves in mock fights, and where no combatant has, as yet, succeeded in gaining an inch of ground that he could call permanently his own".[2] But such conditions are, Kant holds, the result of wrong method and may be overcome. He has a firm belief in the necessity for and the value of metaphysics, but it must be a thoroughly scientific system of metaphysics, and his critique is written as a necessary preparation for such a system. Such a metaphysics will not be based upon assumptions accepted without criticism, it will not be a dogmatic philosophy like that which resulted from the rationalistic school. In a foot-note contained in the preface to the first edition of his Critique of Pure Reason, Kant says,—"Our age is, in every sense of the word, the age of criticism, and everything must submit to it. Religion, on the strength of its sanctity, and law, on the strength of its majesty,

[1] Max Müller's Edn. P. XIX.
[2] Ibid. P. 692.

try to withdraw themselves from it, but by so doing they arouse just suspicions, and cannot claim that sincere respect which reason pays to those only who have been able to stand its free and open examination".[1]

Now an adequate system of philosophy will be based, Kant holds, upon criticism, but a criticism more consistent and thoroughgoing than that implied in scepticism, which contents itself with being merely destructive and tends always to a fresh dogmatism, a criticism which implies an analysis of the human understanding including what Kant called the pure reason. By such a criticism the inadequacy of scepticism, based upon empiricism, and of dogmatism, based upon rationalism, will be shown and the way prepared for a more consistent and more secure philosophy. Then weariness and indifferentism will no more prevail but philosophy, as a true science, will occupy its proper place and perform its true function.

But the critical insight of the keen-minded Kant was directed not only to the confusing and contradictory conditions in the realm of philosophy; he turned his attention, likewise, to the natural sciences of his day, and, there, he saw two things which impressed him strongly. He saw first, that, because of a proper method, the sciences were building, upon a secure and firm foundation, a vast edifice of knowledge; but he saw, secondly, that, in the realms of physics and mathematics, there was prevalent amongst the special scientists a problematic view of the nature of space. Before dealing with the Kantian analysis of the method of science, it will be well to trace briefly the history of this view of space as it was held from the time of Galilei on. This will be especially appropriate in as much as it will serve to show the significance of Kant's own doctrine of space and will also exhibit a very close relation between the developments in the natural sciences and in certain of the philosophical investigations of the time.

The theory that there is an objective, absolute space is one which finds its more modern expression, first, in the writings of Galilei, Hobbes and Des Cartes. These men all accepted what is generally known as the theory of the subjectivity of the sense-

[1] Max Müller's Edn. P. XIX.

qualities. Galilei, writing as early as 1623 in Il Saggiatore, a polemical work on astronomy, makes the claim that the sensations of taste, smell, colour, etc. are not, as have been formerly held, qualities of things but that they have their seat in the sensitive body. An object is called red not because it itself is red but because it excites that sensation in us, that is, in the physiological organism. On the other hand, however, there are certain first and real qualities (*primi e reali accidenti*), which are inseparable from things. These are figure, magnitude and motion or rest. By these qualities of things, that is by motions in space, Galilei thought to explain all other qualities. In his famous Dialogue he clearly expresses the view that it is only possible to understand the qualitative changes in nature when these can be traced back to quantitative changes. Now such a view, implying that there is an objective, absolute and realistic space, in which occur certain movements which give rise to sensations, lies at the root of nearly all the mechanical views of nature that have been advanced since the time of Galilei. Gassendi, in his writings, and Newton, in his Principia and Opticks, held essentially this same theory in regard to space, while, in recent times, physical science, with but few exceptions, presupposes an absolute space which it claims to be independently real.

But this theory of space has been dominant not only in physical science; its influence is also to be clearly seen in philosophical circles. The mechanistic and materialistic world-views, which have been advanced from time to time, rest upon this assumption in regard to space, and the fact that the same theory of space has been held so generally in the special sciences has often helped to validate in the eyes of many these incorrect and inadequate philosophical theories.

If one turns to the centuries immediately preceding the work of Kant, he finds that these views in regard to space were prevalent in nearly all of the philosophical writings of that time. Hobbes held that "a body is that, which having no dependence upon our thought, is coincident or coextended with some part of space".[1] Space, that is for Hobbes, real space and not imaginary space, for he distinguishes these two, is a characteristic common to all

[1] De Corpore, Ch. VIII, Par. 1.

bodies. It is synonymous with extension or magnitude and "does not depend upon our cogitation".[1] It "is an accident . . . of a body existing out of the mind".[2] Des Cartes, of course, as has been already seen, held a quite similar view, and the influence of this same doctrine is apparent upon the English philosophers, Locke, Berkeley and Hume. But it is in this last trend of thought that this conception of space as absolute and independent is seen to be erroneous, when regarded in any other way than as a more or less arbitrary assumption. Locke, in distinguishing the primary from the secondary qualities, followed Galilei very closely, adopting even his terminology, but, by so doing, he got into difficulties which, on that basis, were insuperable. Berkeley and Hume, as has been indicated, found certain difficulties in this view from the standpoint of what they called knowledge obtained through ideas, and were able to make valuable suggestions towards its solution. But, notwithstanding their efforts, the older theory of space remained firmly established in the mathematics and physics of the day, and this made it necessary for Kant to approach this problem. The question all the more imperatively demanded attention because the view of space, advanced by Hume, as well as that held by Leibnitz, which made space a confused idea of the relation of monads themselves non-spacial, was thought to be irreconcilable with the actual results of the special sciences. On the former view, that of the physical sciences, the world of space and motion, abstracted from all supposed subjective content, seemed to present a field of operation for the "rational and universal" procedure of mathematics. On the empirical view, if all our knowledge results from experience and experience consists in continued perceptions or the succession of impressions and ideas, then there are no universality and necessity, but only the observed uniformities, which may be disarranged by the appearance of a totally different and unexpected event. This dilemma or this opposition naturally brings forward the question as to the validity of the claim of the rationalistic or mathematical side for universality, and, in a word, produces the query, how are such universal and necessary judgments at all possible? This was exactly the question which Kant faced.

[1] De Corpore, Ch. VIII, Par. 4.
[2] Ibid.

But, in seeking a solution of this problem, Kant was led to investigate the nature of the method which the sciences were using. And here a state of affairs presented itself, which, to an acute thinker like Kant, could not have been otherwise than very significant. In philosophy, deduction and induction, as methods, had become so opposed one to the other, that the era, so far as philosophy was concerned, could well be described as the age of the battle of world-views. But, in the natural sciences, conditions were quite otherwise. There, both methods of investigation, though differentiated to a degree, were to be seen working harmoniously side by side in the treatment of different data or in the different treatment of the same data. Indeed, frequently, induction and deduction were both exhibited in the work of one single investigator. Between the work of Galilei, obtaining the law of falling bodies, and that of Newton, obtaining the law of gravitation, there is no question of opposition, and yet one employed, mainly, a process of deduction and the other, mainly, a process of induction. Furthermore, as Wundt[1] points out, it is quite conceivable that these laws might just as easily have been determined, in each case, by the reverse process. Moreover, though it is generally said that Galilei used the method of deduction in discovering the law of falling bodies, yet it must be recognized that he used, too, the method of induction. Certain facts were observed, certain experiments made and then certain hypotheses or inductions made. Galilei first assumed that the speed of fall of any object is proportional to the distance through which the object has fallen. But by deduction, that is, by determining by experiment or otherwise the consequences of the general law assumed for the time being as valid, he found that this theory was incorrect. Galilei then tried the supposition that the speed of falling bodies varies proportionately to the time of fall and, this time, experimental verification of the supposition resulted, so that the law of falling bodies became formulated. The law, it is generally said, is a result of deduction, but it can be seen that in this experiment deduction followed induction and that both were mutually complementary.

It is interesting to note that Galilei not only made use of both induction and deduction in his scientific work, but that he, likewise,

[1] Logik, II Bd., P. 30.

was quite well aware of the mutual relation and dependence of the two. In induction, he says, the most characteristic cases are investigated and an inference or hypothesis made in regard to others. But these inferences, or the consequences thereof, must be confirmed by trial in particular cases. Galilei has no sympathy with merely formal, deductive logic, and the appeal, in special cases to the Divine, as a cause, he unhesitatingly condemns; such a method explains nothing just because it explains everything equally easily.

Now when Kant saw in the sciences of mathematics and physics indisputable results of the harmonious combination of scientific method, results which from the time of Galilei were becoming more and more valuable, he realized the necessity of inquiring more carefully just what that method was and of asking himself how the supposed necessary and universal knowledge in these sciences was possible. And so Kant commenced his first critique by asking the question, how are synthetic judgments *a priori* possible? Now what is the significance of this question? Judgments, which merely explicate what is already contained in any given concept, are analytic judgments, and, because purely formal, are always necessary and universal, that is, in Kant's terminology, *a priori*. Such judgments as, for example, all bodies are extended do not, however, add anything to knowledge. But, if there is added to the concept of the subject a predicate not conceived as existing within it, and not to be extracted from it by any process of mere analysis, then a synthetic judgment results. For example, the judgment, all bodies are heavy, is a synthetic judgment, if heaviness be not conceived as a necessary part of the connotation of the subject, bodies. But such a judgment is not necessary or universal. It expands knowledge, but, since it is based on sense-experience, it is not *a priori*. It is *a posteriori*, a synthetic *a posteriori* judgment. But there are, according to Kant, judgments other than the analytic *a priori* and synthetic *a posteriori*. There are judgments which serve to expand knowledge and which likewise are necessary and universal. There are synthetic *a priori* judgments. Mathematics, for example, affords illustrations of such synthetic *a priori* judgments. All which happens has its cause, is another example of such a judgment. Now

how are these judgments, which are actually operating in science, possible? This is Kant's question. There is no difficulty about the possibility of the analytic judgment. It is simply a making clearer that which is already known. There is no difficulty about the possibility of synthetic *a posteriori* judgments. Sense-experience supplies the ground of such judgments. But the statement, every effect must have its cause, is not, for Kant, analytical. The concept, cause, is not included in that of effect. Neither is the judgment based upon sense-experience. Sense-experience can never supply the generality and necessity implied in such a judgment. How then are these judgments possible? This is tantamount to saying, how is science itself possible. Kant bases his reply upon his view of knowledge as consisting of two factors, sensibility, by which objects are given, and understanding, by which thought is given, and it is the understanding which supplies the concepts by means of which the synthetic *a priori* judgments are made.

Those empiricists who would make sensations the only constituents of knowledge, who would identify knowledge with sense-experience are then incorrect. There are other factors than sensations. Even in sensibility there are space and time. These two pure forms of sense-perception, as Kant calls them, are not derived from sensations but are rather conditions of sensations, and should be thought of as brought to experience by the mind. But knowledge consists not only of sensibility, there is likewise the understanding with its categories. These categories twelve in number, according to Kant, consisting of those of quality, quantity, relation and modality, are pure concepts of synthesis and necessarily belong to the understanding, and it is because of these, as said above, that synthetic *a priori* judgments are possible. But, though Kant has made this division of knowledge into sensibility and understanding, he is careful to emphasize the fact that these two stems of human knowledge are mutually complementary. As he himself puts it, "Gedanken ohne Inhalt sind leer, Anschauungen ohne Begriffe sind blind. . . . Der Verstand vermag nichts anzuschauen, und die Sinne vermögen nichts zu denken. Nur daraus, dasz sie sich vereinigen, kann Erkenntnisz entspringen".[1]

[1] Kritik der reinen Vernunft, Transc. Logik., Einleitung. I.

It follows from this position that there can be no knowledge of things outside possible experience, that is sense-experience. The categories of the understanding are empty when there is no content provided by sensibility, and so, knowledge of the supersensuous is a contradiction in terms. All knowledge implies the sense-content with the pure forms of space and time and likewise the categories of the understanding. In this way, Kant deprives speculative reason of its pretensions to transcendent insights, showing that a knowledge of the transcendent would be inherently inconsistent. But the work of the Königsberg philosopher does not end here. He sees that an account of knowledge such as he has given is not a completely adequate account of all man's experience. In his Dialectic, Kant, recalling the work of the great Greek philosopher, says, "Plato knew very well that our faculty of knowledge was filled with a much higher craving than merely to spell out phenomena according to a synthetical unity, and thus to read and understand them as experience. He knew that our reason, if left to itself, tries to soar up to knowledge to which no object that experience may give can ever correspond; but which nevertheless is real, and by no means a mere cobweb of the brain".[1]

This "higher craving" manifests itself especially in the practical or moral realm, and, because of the demands of the Practical Reason, there are posited or affirmed certain Ideas of the Reason. Here, Kant adopts the Platonic term and insists most strenuously that these Ideas must not be confused with the concepts of the understanding. To do that, leads to the endeavour to know that which, on the Kantian basis, it is impossible to know. It is to commit the mistake of rationalism, which, in its psychology, cosmology and theology has been led into error and inconsistency by just such an attempt. The Ideas of Reason are such that they can never be denied by theoretical knowledge, and experience, especially in its practical aspect, demands that such Ideas be posited as completions of actual human knowledge and human morals.

Knowledge, from the standpoint of the critique of Pure Reason, becomes entangled in inevitable antinomies if it attempts to transcend the limits set by Sensibility. And so, as Kant said, he "had

[1] The Critique of Pure Reason, Max Müller's Edn. Pp. 255-6.

therefore to remove knowledge, in order to make room for belief".[1] It is in the critique of Practical Reason that Kant argues for the necessity and validity of making assumptions which theoretical knowledge cannot disprove and which moral life demands. For example, Practical Reason demands the freedom of the will. Man, in the capacity of moral agent, as a member of the noumenal world, gives laws to himself as a member of the realm of sense or the phenomenal world. "Thou oughtest" implies "thou canst". Because Kant separates so completely the rational and the sense realms he seems to see no difficulty in positing the freedom of the will. Freedom of the will is that autonomy, which constitutes the will a law to itself, and it is possible because "Man, considering himself . . . as an intelligence, places himself in a different order of things and in a relation to determining grounds of a wholly different kind when on the one hand he thinks of himself as an intelligence endowed with a will, and consequently with causality, and when on the other he perceives himself as a phenomenon in the world of sense (as he really is also), and affirms that his causality is subject to external determination according to laws of nature."[2] In theoretical knowledge the law of cause and effect has universal applicability but it is a demand of the moral law that the will be free. It is this freedom which makes possible obedience to the Categorical Imperative, an imperative which the will is led to utter because man is member not only of the rational world but also of the sensible world.

On the same basis, Kant goes on to show how man's practical reason demands, likewise, two other Ideas, Immortality and God. "The perfect accordance of the mind with the moral law is the supreme condition of the *summum bonum*."[3] But such a condition no rational being of the sensible world can attain at any moment of his existence. It is therefore necessary to assume an infinite progress towards that perfect accordance which again is possible, Kant holds, only "on the supposition of an endless duration of the existence and personality of the same rational being (which is called the immortality of the soul)."[4] Therefore the immortality of the soul is a second postulate of the Pure Practical Reason.

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[1] The Critique of Pure Reason, Max Müller's Edn., P. 700.
[2] The Meta. of Morals, Abbott's tr., P. 77.
[3] Cr. of Pr. Reason, Abbott's tr., P. 218.
[4] Ibid. Pp. 218-9.

But, since there is demanded another element within the *summum bonum* viz., happiness proportioned to the first and principal element, *i.e.* the morality resulting from the perfect accordance above mentioned, there arises a third postulate of the Pure Practical Reason, and this is the existence of a cause adequate to this effect, or the existence of God. These three postulates are the result of man's practical, or moral, nature; they all proceed, as Kant says, from the principle of morality. Yet they do not extend in any way man's theoretical knowledge, for we do not know the nature of our souls, nor of the intelligible world (where, nevertheless, freedom is possible), nor of the Supreme Being.

It must not, however, be supposed that these Ideas are mere phantoms of reason, which tend to lure one away from the true path of knowledge. To be sure, their true function has been often misunderstood and so has resulted that Illusion to the dissipation of which Kant devotes his keen intellect. But these unconditioned Ideas, Ideas of the soul, the world and God, and moral postulates of freedom, immortality and God, which carry us beyond the sensible objects, perform, in the Kantian philosophy, their true function, so far as theoretical knowledge is concerned, as regulative but not constitutive Ideals for knowledge and as suggestive of a system wherein the data of the understanding and the Ideas of the reason have each a place.

Such a theory of knowledge and such a philosophic system, even though this latter be but suggested in the critiques, had a wonderful effect upon the existing conditions in the realm of philosophy. By showing the fallacy of giving a sense-content to those objects Kant called Ideas of Reason and by exhibiting the inutility of a merely analytic method, Kant indisputably proved that the rationalism of his day, as theory of knowledge, and dogmatism, as a philosophic theory based thereon, were not only inadequate but were also incorrect. Kant, himself a rationalist, has been, nevertheless, one of the greatest critics of rationalism. His conclusions likewise showed that empiricism, as he understood it, needed to be supplemented, and the scepticism, which was based thereon, needed to be corrected by a more careful investigation of human experience. But, notwithstanding his insight, Kant himself was, to a very serious extent, dependent upon and influenced by the errors and presuppositions of his time.

## CHAPTER VII.

### The Significance of the Critical Philosophy of Kant.

The critical investigation which Kant undertook, though it showed the onesidedness of both rationalism and empiricism was based, nevertheless, upon a view of the nature of knowledge which may well be called in question. Kant commenced his first critique with the statement that "there are two stems of human knowledge, which perhaps may spring from a common root unknown to us, viz. sensibility and the understanding, objects being given by the former and thought by the latter".[1] This statement of Kant is very significant. It shows at once the influence of empiricism on the one hand, and of rationalism on the other, and it suggests the means whereby Kant intended to attempt the reconciliation of the two hostile camps. There are two stems of human knowledge, sensibility and understanding. Each of these, Kant goes on to claim, depends upon the other and without both there is no (theoretical) knowledge at all possible. But, though Kant may be able to show the inadequacy of the two antithetical tendencies, rationalism and empiricism, yet it becomes necessary to ask whether his own view of the nature of knowledge was correct. In order to do that we must inquire whether knowledge actually reveals two such stems as Kant mentions.

Now such a problem, to be solved adequately, lends itself to but one method, and that is the method of analysis or abstraction. The actual matters-of-fact must be investigated, must be analysed, and if, as a result of analysis, there are revealed two "stems" of knowledge such as Kant emphasized, then the statement above quoted will be proved correct. To follow any other plan will lead only to uncertainty; to begin with presupposition and theory instead of with the actual facts will avail nothing. Commencing then with that which is immediately present in experience, using this word in the broadest sense possible and not in the Kantian sense, analysis may separate out from the complexity of the whole

[1] Op. Cit. P. 12.

experience certain less complex constituent parts. These may be subjected again to analysis and so on, until, finally, having commenced with the original unitary experience, we come at last to those constituents which appear to resist further analysis. These may be designated as elements.

But Kant's view seems to rely not on any such analysis. It is his endeavour apparently to get back of the actual facts which constitute knowledge, and find out their origin or cause. Sensibility and understanding, instead of being class-names to denote the products of analysis, he tends to make the origin of the two classes of facts. This seems all the more a correct interpretation of Kant, because of the parenthetical clause in the above statement, which suggests that the two stems may spring from a common root unknown to us. Behind sensibility and understanding there may stand a common origin which then would account for all human knowledge. Now such a procedure, as Kant himself was ready at times to point out, leads away from knowledge and into insuperable difficulties. A system of philosophy which would be adequate must build upon an investigation of the facts. Kant claimed to have produced in his Critique of Pure Reason an introduction to such a system. His preliminary suppositions however were bound to lead him astray and to vitiate his conclusions.

That there are under the general head, knowledge, two classes of facts corresponding, on the one hand, to the facts attributed by Kant to sensibility, and, on the other, to those attributed to understanding might be true. The results of the analysis can alone determine that. But to assume that there are two origins of knowledge by one of which "objects" are given while by the other "thought" is given is purely hypothetical and clearly arbitrary. It was because Kant made this assumption that he was led to regard sensibility and understanding as being disparate, and as needing in some way to be united. It was a similar oversight that led Kant to sever so completely theoretical and practical knowledge, and which caused his fundamental distinction between knowledge and belief. Had the writer of the critiques been true to his own critical method, and commenced with an unprejudiced investigation of the unitary experience, he would have found that, after his analysis, he had certain abstracted constituents of

human experience, which were originally given in one complex whole, which were therefore neither fundamentally diverse, nor, on the other hand, in need of any artificial schematism or arbitrary synthesis. That the theoretical and practical are other than abstracted parts of the unitary human experience, that the knowing man is so different from the believing man, that the sensible man is other than the rationa' man,—these are assumptions which the analysis of the facts can never substantiate. There may be and, of course, are different classes of facts which go to make up knowedge, but the common origin of all these is the originally occurring unitary human experience.

Had Kant realized the truth of this position he would never have advanced the arguments which he did to prove that space and time are pure forms of perception. Space, Kant said, is not an empirical concept which has been derived from external experience. It is rather a necessary, *a priori* idea forming the very foundation of all external perceptions. The matter (sensations) of all phenomena is *a posteriori*; the form, or the order of the arrangement of sensations, (space and time), is *a priori*. In other words, space and time cannot be obtained by an analysis of experience, they are on the contrary in the mind, and, as pure perceptions, exist in the mind as mere forms of sensibility, even when no object is present to the senses.[1] Now what can Kant mean by thus claiming that space and time are pure forms of perception? That he was quite right in holding that sensational qualities *per se* cannot explain their order of arrangement must be agreed by all. Sensation plus sensation never can give us space, never can give us time, unless these are already presupposed. But it by no means follows that space and time must belong to a mind to which sensations do not belong. On the contrary, spacial ideas and temporal ideas, or, in other words, spacial and temporal arrangements of sensations are found as constituents of a unitary experience. It is by analysis from such an experience and from such constituents of experience that not only sensation but also space and time are finally obtained. So then space and time are not perceptions at all. They are concepts obtained by the analytic investigation of the complex facts of experience. Space as space,

[1] Op. Cit. Cf. Pp. 16-17.

time as time, are never immediately given either as matter or as form.

Kant, when arguing for his view of space, claims that "it is impossible to imagine that there should be no space, though one might very well imagine that there should be space without objects to fill it".[1] Apparently Kant would hold that it is possible to have a knowledge of space without sensational content. It may be pointed out that this not only runs counter to the tenour of his own argument in the transcendental Logic, where Kant claims that by the union only of the understanding and the senses can knowledge be produced,[2] but, likewise, contradicts all experience. The imagination of even a vacuum does not rid one of sensations. Such an experience must have a sense content simply because the space, whether void of objects or not, is conceived as bounded. Space, Kant contends again, is an *a priori* perception which necessarily precedes all external phenomena. Grant that this necessary preceding is logical only, the statement still is untrue because sensations are equally necessary. No logical priority can be granted to either. If space be "a condition of the possibility of phenomena", sensations likewise are a condition of the possibility of phenomena. The argument which makes one *a posteriori*, makes the other *a posteriori*, that makes one *a priori*, makes the other *a priori*. In other words, the distinction between *a posteriori* and *a priori* as used by Kant breaks down. Kant's contrary declaration is due to his assumption of the possibility of mere space. Similarly with Kant's arguments with regard to time. Space and time, contrary to Kant's view, are both concepts derived from experience. Sensation, likewise, is a concept derived in the same way, and it is the analysis of the actually given complex facts which enables us to obtain such concepts.

Kant advances in the aesthetic another statement which must be called in question. He affirms that space is a pure perception because there is only one space. If we speak of many spaces we mean parts only of one and the same space. Now, if it were granted that space is one, by which Kant apparently meant that it is qualitatively the same throughout all experience, it cannot there-

[1] Op. Cit. P. 19.
[2] Op. Cit. P. 41.

fore be contended that space is a perception. It must still be obtained from the analysis of experience; it still would be a concept arising in the same way as the concept sensation. But, furthermore, though, to be sure, space seems relatively to be one when contrasted with the multitudinous sensational qualities, it is a big assumption on the part of Kant to claim that the space of our perceptions and the space of the geometer, the space of our memories and of our imaginations and of our dreams, visual space and tactual space are all homogeneous. This is a problem the solution of which can come only after careful investigation. Under any circumstances, it is by no means a self-evident fact that space is one. No doubt it was easier for Kant to assume the unity of space because of his distinction between the inner and outer senses. Space is the form of the external sense only. By means of our external sense, a property of our mind (Gemüth), we represent to ourselves, he says, objects as external and outside ourselves, and all of these in space. Though time is a condition of all phenomena, space is a condition of external phenomena only. This doctrine of Kant, since it apparently denies spacial characteristics to our memories and imaginations, is quite untenable. Furthermore, Kant seemed not to have realized that only certain of our so-called external sensations, viz. visual and tactual sensations, have spacial extension.

The transcendental argument, which Kant has also used to establish his view of space, is of course no direct proof that space is a pure perception. If his theory of space did make possible the apodictic certainty of geometry, one would still have to ask the question,—is the theory correct, can it be proved by the facts? Since the theory does not stand the test of fact, we must look elsewhere to understand the supposed necessity and universality of geometry.

It appears then that Kant, in the very beginning of his critical work; has fallen into no small error. The unwarranted assumption that there are two stems of human knowledge which are different sources of human knowledge manifests itself in the transcendental aesthetic in the kind of differentiation made between sensations on the one hand, and space and time on the other. The conclusions of the aesthetic are incorrect. Kant gives us, instead of a

critical and analytical account of the nature of sensations and space and time, a theory of sensations and space and time which, for the reasons stated, cannot be accepted. If the original assumption, which he made, manifested itself in the aesthetic, it manifests itself *a fortiori* in his analytic, where he proceeds to deduce, supposedly from the nature of the understanding, the so-called categories of the understanding. It is a common criticism urged against Kant that the twelve categories, which, he affirmed, belong to the understanding, were chosen somewhat arbitrarily, and based mainly upon the conclusions of formal logic. This criticism is quite true, and the subsequent development of philosophy soon undertook to give what was thought to be a more adequate treatment of these categories. There is, however, another point of which any critical consideration of Kant's deduction of the categories must take account. It is here that his original assumption once more blinds Kant's eyes to the facts, and so leads him into further error. The table of twelve categories which Kant sets down constitutes, he claims, "all original pure concepts of synthesis, which belong to the understanding *a priori*".[1] These categories or concepts of synthesis are, in their unity, what Kant calls the Original Synthetical Unity of Apperception, and, just as the highest principle of the possibility of perception in relation to sensibility was that it should be subject to the formal conditions of space and time, so again "the highest principle of the same possibility in relation to the understanding is, that all the manifold in intuition (perception) must be subject to the conditions of the original synthetical unity of apperception".[2] Because these concepts are *a priori*, and originally in the understanding, the claim of science to universality and necessity is, Kant believes, validated. But why must the Königsberg philosopher treat these concepts or categories as originating in a source different from that which gives rise to sensations? Why must these concepts be attributed to an understanding which is fundamentally different from sensibility? There is no answer to this question in the critiques of Kant, simply because he did not realise the nature of the mistaken assumption with which his work commenced. Knowledge, he held, implies both sensibility and understanding, but these are not for

[1] Op. Cit. P. 67.
[2] Op. Cit. P. 748.

Kant two abstracted parts of human experience. Within man's unitary experience there are found certain processes which might possibly be subsumed under a general term like that of understanding. Voluntary combinations of less complex constituents of experience into more complex processes[1] are generally called, nowadays, apperceptive combinations. Such combinations include those of relating and comparing with the still more complex processes growing out of these of synthesis and analysis. It is in this connection that the word, understanding, may receive a connotation which is based on the actual facts. We need not limit the meaning of the word to the "perception of agreements and differences and other derived logical relations between contents of experience",[2] it may possibly be made to include also certain more synthetic functions akin to those illustrated by the activity of the imagination, but, under any circumstances, the facts denoted by the word show, in certain salient respects, a startling lack of agreement with those denoted in the Kantian use of the word. Indeed, Kant's categories of the understanding seem, after all, to be little more than modes of predication. They constitute a number of ways in which assertions may be made in regard to a given subject. Dr. Kirschmann has illustrated this particular point in the following way. His own words are given, "Man betrachte die folgenden beiden Sätze: (1) Wenn in einem Dreieck zwei Seiten gleich sind, so sind auch die diesen Seiten gegenüber liegenden Winkel nicht verschieden. (2) Alle Dreiecke, welche zwe gleiche Seiten haben, mussen auch zwei diesen gegenüberliegende gleiche Winkel aufweisen. Das erste dieser Urtheile ist ein besonderes, verneinend, hypothetisch und assertorisch; das zweite ist allgemein, bejahend, kategorisch und apodictisch. Trotzdem aber bedeuten beide Urtheile genau dasselbe."[3] The categories, it would then appear evident, represent different forms of predication and not different functions of thought.[4] For Kant himself, however, they certainly meant more than merely modes of predication, in as much as he considered them suggestive, indeed illus-

[1] Cf. Wundt: Outlines of Psychology, 3rd Eng. Edn., Par. 17.
[2] Ibid. P. 301.
[3] Philosophische Studien Vol. XIX, P. 387, footnote.
[4] For a further criticism, though from a different standpoint, of the categories of Kant, cf. Am. J. of Psy. Vol. 23—Why Kant is Passing: G. Stanley Hall, Pp. 374-380.

trative of an original synthetic activity. But Kant failed to adduce an abiding account of the understanding because a proper investigation was inhibited by his fundamental presupposition. To assume certain "stems of knowledge", instead of ascertaining by analysis the classes of knowledge, inevitably invites failure.

It was this very same mistake which forced Kant to seek some nexus or link between sensibility and the understanding, in other words, which made necessary the schematism of the categories. Because of his unfortunate mode of procedure, Kant is face to face with what is really, on his basis, an insuperable difficulty. No one, says Kant can hold that causality, to instance one of his categories, can be seen through the senses or that it is contained in the phenomena. The "pure concepts of the understanding, as compared with empirical or sensuous impressions in general, are entirely heterogeneous".[1] But since knowledge is possible only through the union of categories, or concepts of the understanding, and empirical or sensuous impressions, there must be some way of bringing these two heterogeneous stems of knowledge into relation. How is this to be done? Kant attempts the reconciliation by making use of one of the pure forms of perception, viz. time. Time, as the formal condition of all phenomena is homogeneous, on the one side, with the categories, and, on the other, with the phenomena, and so, Kant claims, it renders possible the application of the former to the latter. But such a solution is really no solution at all. Phenomena and the categories are heterogeneous. This Kant has assumed. Phenomena he says are composed of matter, sensations, and form, space and time. By what right, now, can a part of phenomena, time, be said to be homogeneous with the categories when such a homogeneity is denied to the whole? It is only by ignoring his first assumption that Kant, in this latter assumption, effects a union of sensibility and understanding. Furthermore, why single out time to perform this unifying function? True, on Kant's basis, space does not apply so generally as time, since the latter is the formal condition of both outer and inner sense. But is there any possible reason why the categories might not be mediated to external, though not to internal, phenomena through the schema of space as well

[1] Op. Cit. P. 112.

as, or instead of, that of time? To this question Kant's argument can hardly supply any answer, and yet he assumes time to be the only means of uniting sensibility and understanding.

This union of sensibility and understanding, obtained as Kant thought by means of the pure form of sensibility, time, constituted for him knowledge. "The understanding cannot see, the senses cannot think. By their union only can knowledge be produced."[1] Because of this standpoint there arose that distinction between phenomena and noumena which Kant has emphasized to such a great degree. But Kant was not the first to draw such a distinction. It will be remembered that in the brief space devoted above to David Hume his discussion of the problem of "continued existence" was emphasized as of great importance. Of such a continued existence we have no knowledge whatsoever, declared Hume, but our belief in an independent and continued existence it is impossible, he claims, ever to eradicate. In almost the same words the philosopher of Königsberg sets bounds to knowledge. All knowledge is confined to phenomena. It can never apply to things by themselves. In thus limiting knowledge, Kant made room, he claimed, for belief.

It is important to note, before passing to a consideration of this view of the limits of knowledge, that between the conclusions of Hume and those of Kant there is very little real opposition. That there was a fundamental difference between rationalism and Hume is manifest. The rationalists claimed to have sure and certain knowledge of those things of which Hume considered it necessary to deny knowledge. Kant, in his criticism, "removed" the knowledge of rational cosmology, psychology and theology, and, in showing the contradictoriness of giving a sense content to the Ideas, corroborated the very position which Hume had held. If Kant held to a phenomenal world of which there was knowledge and to a noumenal world of which there could be none, so Hume, with as much definiteness, though with less elaboration, laid emphasis upon a similar distinction. If Hume was a sceptic, then was Kant likewise a sceptic. In like manner, it might be pointed out that Hume, an empiricist as history has classed him, laid almost as much emphasis upon reasoning processes in, for example, his

[1] Op. Cit. P. 41.

discussion of "philosophical relations", as did Kant himself. If Kant was, in this sense, a rationalist, then was Hume likewise a rationalist. It is seldom possible to fit men into the artificial classes which have been devised. Such classifications show only general tendencies, and sometimes not even those. But it is the Kantian doctrine of knowledge and its limitations with which we are here especially concerned, and to that attention must now be directed.

It is Kant's contention that we know only phenomena, and, in the dialectic, especially, he argues repeatedly against the extension of human knowledge beyond the limits of (sense)-experience. "The critique of the pure understanding does not therefore allow us to create a new sphere of objects beyond those which can come before it as phenomena."[1] But man, so Kant saw, is not content with such knowledge; there are also in his consciousness certain necessary concepts of reason to which the senses can supply no corresponding object. These concepts must be distinguished from those of the understanding, and Kant chooses to designate them by the Platonic word, Idea. Such Ideas "are not mere fancies, but supplied to us by the very nature of reason, and refer by necessity to the whole use of the understanding".[2] They are classified by Kant under the heads of Ideas of the soul, the world, and God. The significance which these Ideas have is of the utmost importance. They have a most admirable and indispensably necessary regulative function to perform, for they serve as a canon or rule to the understanding for its extended and consistent use. Of themselves these Ideas of Reason can never give rise to deception or illusion,[3] it is only when man, who is most prone to such an error, misemploys them making them constitutive rather than regulative, it is then, as Kant says, when they are thus "misunderstood and mistaken for constitutive principles of transcendent knowledge, they produce, by a brilliant but deceptive illusion, some kind of persuasion and imaginary knowledge, but, at the same time, constant contradictions and disputes."[4] There are then within consciousness, within experience as we would say to-day,

[1] Op. Cit. P. 235.
[2] Op. Cit. P. 266.
[3] Op. Cit. Cf. P. 537.
[4] Op. Cit. P. 562.

certain principles which transcend sense-experience. The Ideas of Reason, however, because of his assumption in regard to and therefore limitation of the nature of knowledge are claimed by Kant to be unknown. They have no sense content. Now this conclusion to which Kant arrived is very significant. That there are spacial and temporal relations of sensations within the complex of experience no one can deny. That there are other factors as well, factors that have no sense content whatsoever, is a claim that not only Kant but many others have made. That the objects, which are in experience, when we state a general law or give utterance to a universal judgment are sensational objects is doubted by not a few, and it is claimed that experimental evidence can be adduced to prove that there are in experience what might be called objects of thought. That such non-sensuous thinking is possible further and more careful analysis alone must determine.

Under any circumstances, for Kant there are, as factors of mental operations, sense, understanding and reason. The first two of these are the stems of knowledge. The Ideas, which reason supplies, are not constitutive of knowledge in that strict sense in which the word is employed by Kant. But there were certain problems still to be faced. Kant must ask himself wherein lies the objective validity of knowledge; what, in other words, is to distinguish true scientific knowledge from the mere fancies of imagination? Now the critique of pure reason claims that the objects of which science has knowledge are phenomena only. They are not unknown and unknowable things-in-themselves, nor, on the other hand are they merely subjective. That which is material or real is not independent of consciousness but "presupposes necessarily perception, and cannot be fancied or produced by means of imagination without that perception, which indicates the reality of something in space".[1] "All external perception proves immediately something real in space, or rather is that real itself."[2] The objects then with which science deals are not transcendent x's; they cannot be such if for no other reason than that they are in space and time and these are, according to the aesthetic, forms of perception within the mind. Nor are the objects of science merely subjective phantasies, for these objects

[1] Op. Cit. P. 303.
[2] Op. Cit. P. 304.

of science, of true knowledge, are so Kant claims objectively real. Now what does Kant mean by this objective reality? In other words wherein lies the distinction between subjectivity and objectivity? In the transcendental dialectic, he says that, in order to escape from the "false appearances", or the deceptions, due to illusions of imagination or to faulty judgments, "one has to follow the rule that, whatever is connected according to empirical laws with a perception, is real".[1] It is in such a *connection* that objectivity is to be found. In imaginations, where errors may arise, objects may be represented without their presence in perception,[2] but when we follow the rule just stated we escape error and illusion. It is, then, a connection of objects according to empirical laws with a perception which constitutes the reality and objectivity that distinguish knowledge from imaginations, these latter being purely subjective. Such a connection, however, is not imposed by extra-experiential things upon consciousness, but is, on the contrary, the essential function of the understanding itself. All connecting, all synthesis is an act of the understanding, and "can never enter into us through the senses".[3] "Connection . . . does never lie in the objects . . . but is always an act of the understanding, which itself is . . . a faculty of connecting *a priori*, and of bringing the manifold of given representations under the unity of apperception."[4] It was in this respect that Kant suggested that his work meant a Copernican revolution in the history of thought. Knowledge does not conform to things-in-themselves, but "objects, or what is the same, the experience in which alone they are known (as given objects), must conform to those concepts"[5] which are referred by Kant to the understanding. It is these concepts which, according to the critique, make experience possible, as we have seen, and, because they possess objective validity,[6] they give to real knowledge its objectivity. In imagination, on the contrary, there may be no object given in perception, and we have merely subjective and not objective validity. Thus

[1] Op. Cit. P. 305.
[2] Op. Cit. Cf. P. 757.
[3] Op. Cit. P. 744.
[4] Op. Cit. P. 747.
[5] Op. Cit. P. 693.
[6] Op. Cit. Cf. P. 78.

Kant distinguishes imagination wherein error may arise from scientific knowledge.

It was this position which enabled Kant to see so clearly the fallacies of rational psychology, cosmology and theology. The Ideas of Reason were claimed by current rationalism to give sure and certain knowledge of the soul, the world and God. But Kant saw that when such Ideas were made constitutive the rationalist was misunderstanding the true purpose of the Ideas. True knowledge arises when the understanding, through its categories and through space and time, gives a necessary connection to objects presented in perception. But the Ideas of Reason are given to us by reason, and there are no objects, corresponding to these, presented in perception. If imaginations have no objective validity, neither have these Ideas. Therefore no such knowledge, as the rationalists claim, is at all possible. In the transcendental dialectic, Kant proceeds to show the inconsistencies, which necessarily result when the Ideas of Reason are treated in any other way than regulative. To make them constitutive, *i.e.* to suppose that they give us knowledge of transcendent objects, is to misunderstand their significance. We can never know objects corresponding to the Ideas. We can have problematic concepts[1] only. Speaking of one of the Ideas, that of God, Kant says what may equally well be applied to the other Ideas, *i.e.* the Ideas of the world and of the soul. "We misapprehend at once the true meaning of that Idea, if we accept it as the assertion, or even as the hypothesis of a real thing to which the ground of the systematical construction of the world should be ascribed. What we ought to do is to leave it entirely uncertain what that ground which escapes all our concepts may be by itself, and to use the Idea only as a point of view from which alone we may expand that unity which is as essential to reason as beneficial to the understanding." [2]

Now, in this view of Kant in regard to knowledge and in his conception of the function of the Ideas, we have a tremendous step in advance. The placing of an artificial gulf between matter and mind, thing and idea—that metaphysical presupposition which had dominated all of the earlier development in rationalism—Kant

[1] Op. Cit. Cf. P. 275.
[2] Op. Cit. P. 547.

here sees to be an arbitrary and invalid procedure. His theory of knowledge is so far free from that barren metaphysical dogma. To get from the idea to the transcendent object, or to get from such an object to the idea—both are equally impossible. To require that knowledge obtains its validity as knowledge only when it corresponds to such objects is to set up an impossible criterion of knowledge. The objects themselves can never be known, and correspondence can never be affirmed. Furthermore, when Kant called attention to the fact that scientific knowledge was not merely subjective but had objective validity, he likewise was emphasizing a distinction of great importance. Theories or imaginations, according to Kant's view, are subjective and are not part of scientific knowledge in the strict Kantian use of that phrase. As he himself says, the reproductive imagination "is subject to empirical laws only, namely, those of association," and "is of no help for the explanation of the possibility of knowledge *a priori*, belonging, therefore, to psychology, and not to transcendental philosophy".[1] In emphasizing the objective validity of scientific knowledge as against any theories of knowledge, empirico-idealistic or otherwise, which would throw doubt upon this, Kant accomplished much. It needs, however, to be remembered that though theories in science may be without the objective validity which Kant claimed for connected perceptions, they nevertheless play an important role in science. It was because, no doubt, Kant was so close to the mathematical work of his day and because, at that time, the importance of theory in physics and chemistry and biology was not so generally recognized as to-day that he laid little importance upon this aspect of science.

Notwithstanding the splendid work of this critical philosophy, notwithstanding the arguments, so conclusively cogent, urged by Kant against the current rationalism, Kant himself was still a rationalist. To realize the truth of this we have only to attend to his view of the nature of the understanding and of reason. We find that these words are not used to designate certain classes of facts or certain conscious processes, but are used to designate the faculties which, in some way, produce the concepts and Ideas attributed to each. Kant assumes, for example, that "as every phenomenon

[1] Op. Cit. P. 758.

contains a manifold, and different perceptions are found in the mind singly and scattered, a connection of them is necessary, such as they cannot have in the senses by themselves".[1] It is the active power for the synthesis of this manifold, attributed finally to the understanding, that constitutes the essential nature of the understanding which accomplishes this synthesizing work through the categories. But, instead of commencing with the unitary complex consciousness or experience, and proceeding by analysis to obtain the "different perceptions", which are never given, as Kant supposed, "singly and scattered", but are always abstracted products, instead of commencing with that complex experience and finding in a similar way what are the actual processes which might be subsumed under the head of understanding and reason, Kant postulated these as faculties which unite perceptions assumed single, and which provide by their own spontaneity the concepts and Ideas of which Kant speaks. In other words, the objects of science in Kant's view, are constructed and not given. This was a great mistake, but one which is easily accounted for on the ground that the only psychology of which he took cognizance was the faculty psychology of Wolff. It was a mistake which later idealists have by no means succeeded in overcoming, and any present-day theory of knowledge, if it follow the Kantian procedure in this respect, may, to that extent, be likewise termed rationalistic. It is from the given whole of experience that one must obtain by analysis the single perceptions as well as the concepts and the Ideas of which Kant speaks.

Before closing this critical estimate of the work of Kant, it is necessary to recall the fact that the Ideas of Reason, which, from the standpoint of the first critique, are regulative only, become in the second critique constitutive. Now this, at first glance, seems passing strange. Has Kant found it necessary to contradict his original position? Does he argue that, after all, the Ideas of Reason do give us knowledge of objects? The key to the solution of this apparent difficulty lies of course in the distinction which Kant drew between theoretical knowledge and practical knowledge. From the standpoint of science, *i.e.* of theoretical knowledge, the objects corresponding to the Ideas of Reason are prob-

[1] Op. Cit. P. 98.

lematic objects only. The Ideas must not be taken as assertions or even as hypotheses of real objective things. But, from the standpoint of morals, *i.e.* of practical reason, what was heretofore a problem now becomes an assertion. The Ideas, formerly only regulative, now become constitutive. "Every employment of reason in respect of an object requires pure concepts of the understanding (categories), without which no object can be conceived. These can be applied to the theoretical employment of reason, *i.e.* to that kind of knowledge, only in case an intuition (which is always sensible) is taken as a basis, and therefore merely in order to conceive by means of them an object of possible experience. Now here what have to be thought by means of the categories, in order to be known, are Ideas of Reason, which cannot be given in any experience. Only we are not here concerned with the theoretical knowledge of the objects of these Ideas, but only with this, whether they have objects at all. This reality is supplied by pure practical reason, and theoretical reason has nothing further to do in this but to *think* those objects by means of the categories. . . . Now when the categories are to be applied to these Ideas, it is not possible to give them any object in intuition; but that such an object actually exists, and consequently that the category as a mere form of thought is here not empty but has significance, this is sufficiently assured them by an object which practical reason presents beyond doubt in the concept of the *summum bonum*, namely, the reality of the conceptions which are required for the possibility of the *summum bonum*, without, however, effecting by this accession the least extension of our knowledge on theoretical principles." [1]

So then theoretical reason is limited in the critiques by practical reason. By the latter we are enabled to have knowledge—practical knowledge—of the objects corresponding to the Ideas. Man, as a moral being, asserts the reality and objective validity of objects which, for theoretical reason, are problematic only, for, in no other way, can the demands of the practical reason be satisfied. But it must not be supposed that by this means theoretical knowledge is in any way extended. The practical knowledge which we have of God, for example, is not a knowledge given in sensible

[1] Cr. of Pr. R., Abbott's trans. Pp. 233-4.

perception or feeling, such a supposed knowledge, Kant claims, is anthropomorphism and the source of superstition, nor is it a knowledge given in any supersensible perception or feeling which leads only to fanaticism.[1] The predicates, by which we may legitimately determine God "are no others than understanding and will, considered too in the relation to each other in which they must be conceived in the moral law, and therefore only so far as a pure practical use is made of them".[2] "There is then a knowledge of God indeed, but only for practical purposes, and if we attempt to extend it to a theoretical knowledge we find an understanding that has intuitions, not thoughts, a will that is directed to objects on the existence of which its satisfaction does not in the least depend."[3]

But, notwithstanding his argument, Kant has, in this regard, placed himself in a strange position. The critical philosophy has secured for man's moral and religious nature inalienable rights, but it has done so at the expense of the unity of man's experience. To divorce so completely as Kant has done the theoretical and the practical is to overlook that fundamental unity of which knowledge and action, science and morals, are only different aspects. When one makes this mistake a sure and certain Nemesis is bound to follow. The difficulties of the second critique reveal the result of this incorrect procedure. The objects of practical reason, so far as they are objects at all, must be given a content, and the predicates by which this is done cannot be other than those or certain of those which apply, likewise, in the realm of theoretical knowledge. Otherwise, morals must dwell in a region of negations only, or of merely formal principles, which can never apply to concrete experience. Kant posits the existence of objects corresponding to the Ideas of Reason. But, if theoretical knowledge and practical knowledge be so disparate, what can existence mean? Kant allows to man, as moral, freedom, and claims for the soul an immortality, but what positive significance, after all, can there be to such a freedom and such an immortality? It would seem that Kant himself realized, in part, the mistake, for the *summum bonum*, or final goal of man's practical life, is conceived by

[1] Cr. of Pr. R., P. 233.
[2] Ibid. P. 234.
[3] Ibid. P. 235.

Kant, however illogically, to contain two elements—perfect morality and happiness proportioned thereto,[1] perfect morality, which implies, on Kant's basis, that man is a member no longer of the world of sense, and happiness proportioned thereto, which assuredly is, nevertheless, a characteristic of this world of sense. It is in this *summum bonum* or this "Kingdom of God", that, according to Kant, "Nature and morality are brought into a harmony foreign to each of itself, by a holy Author who makes the derived *summum bonum* possible".[2] If, finally, the reconciliation is effected, why need we assume that there is here and now such an antipathy? We may and must recognize the possibility of serious errors arising within our reasonings, and of grave inconsistencies among our actions and among our motives, but that the intelligible world and the sense world, the world of morals and the world of knowledge, are so diverse as Kant considered them is a different matter entirely, and one which the facts will by no means substantiate.

Had the Königsberg philosopher commenced with the concrete whole of experience instead of with an abstracted part, assumed to be concrete, his error might have been overcome. He would then have seen in a clearer light the significance of concepts and Ideas,—to retain his distinction. The Ideas of Reason, that is the Ideas of the soul, of the world and of God, should never be taken as giving us sense knowledge of objects to which they are supposed to correspond. Those Ideas should never become, in that sense, constitutive. Kant was admirably correct in regard to that point. But the Ideas of Reason and the moral demands for freedom, immortality and God,—these, as Ideas and demands, are among the facts of man's experience, and, as such, may and should be described and explained in a scientific manner. Analysis must show whether these different complexes of facts contain sensational or emotional data, or both, or neither. Under any circumstances we are trying to understand the actually given facts, and, in so doing, will not be called upon to attempt the impossible task to which Kant, because of his unfortunate method, was led,—the task of describing the nature and relation of empty concepts and

[1] Cr. of Pr. R., Cf. P. 220.
[2] Ibid. Pp. 225-6.

Ideas, produced by the spontaneity of understanding and reason. Whether there are objects, or things-in-themselves, not given in but supposed to correspond to our imaginations and moral demands, remains a matter of no moment to philosophy or science. About such supposed objects, transcending all thought, nothing whatever can be said. That they exist, that they affect our lives,—these statements can mean for us absolutely nothing. To the importance of our imaginations and moral demands, however, sufficient attention has seldom been given.

So then, although Kant pointed the way to the solution of this object-idea fallacy, he was unable, entirely, to throw off the shackles of the past. The dogma of rationalism, that there are real objects different from the objects given in experience, sense or otherwise, still persisted. That dogma still persists, and he who would criticize the work of Immanuel Kant, whether such a one be natural scientist or philosopher, should see to it that he himself is free from any such metaphysical presupposition.

## CHAPTER VIII.

### The Program for Philosophy.

The significance of the critical philosophy of Kant in regard to the problems of knowledge and morals, and in regard to the relation of science and philosophy cannot easily be overemphasized. This is all the more true because the investigations embodied in the critiques form in a very true sense a focus in which the tendencies of the past converge and from which arise likewise new and diverging lines of thought. One of the most outstanding of these post-Kantian developments is the so-called idealistic tendency, the main representatives of which were Fichte, Schelling and Hegel.

Kant, it will be remembered, had emphasized two stems of human knowledge, sensibility and understanding, behind which, he suggested, there may be a common root unknown to us. It was this suggestion which engaged the attention of Fichte, and the result was his denial of any thing-in-itself behind the phenomenal world other than the noumenal subject,—the Ego, as he called it. Schelling, however, in his "System of Transcendental Idealism", was not content, like Fichte, to take his stand upon one of the transcendents of Kant, and claimed that there are an Ego and a Non-Ego, a transcendent subject and a transcendent object, but behind these two, again, there is a common source of both, wherein all opposition of Ego and Non-Ego disappear. This is the Absolute, the synthesis of all contraries. Philosophy is the science of this Absolute which manifests itself in a double manner as Nature and as Mind. Hegel, however, modified this Kantian-Spinozistic world-view of Schelling, by claiming that the common source of the Ego and the Non-Ego does not transcend mind and nature. These latter are not manifestations of a hidden and unchanging Absolute, but the Absolute is mind and nature. It is no longer transcendent; it is no longer unchanging. The Absolute is the process itself.

In this way, Hegel endeavoured to break down the dualism, which, because of the retention of the thing-in-itself, was to be

found within the philosophy of Kant. In the system of Absolute Idealism the objects of science are not merely phenomena for us but are phenomena by their very nature, that is things have the ground of their being not in themselves but in an Absolute Reason. The categories of this Absolute Reason are at once the categories of thought and of all existence, and must not be deduced in the arbitrary and inadequate way by which Kant proceeded, but are to be discovered in the great movement of reason through history. The science which performs this task is called, by Hegel, Logic. But, since such a science is the science of that which not only conceives but also produces and explains all things Hegel's Logic is also a metaphysic or a philosophy. In his own system, however, Hegel considers philosophy to have three divisions. The philosophy of nature and the philosophy of spirit, the second and third divisions of philosophy, are, however, implicitly contained in his Logic, which, according to his scheme, is the first division of philosophy. The Absolute Reason, in the development which constitutes its self-unfolding, externalizes itself, becomes the "other" of itself in nature, and returns from this otherness or self-estrangement into itself as spirit. Herein lies the great example of that dialectical method of thesis, antithesis and synthesis, which Hegel believed he saw at work in various movements within the great process of development.

Now Hegelianism, which the above paragraph has outlined in but the briefest way, is one of the most comprehensive and complete systems which the history of thought reveals. Its effect has been felt in many directions, though in history and theology its influence has been perhaps most pronounced. But absolute idealism has failed to give to the natural sciences an equal place with the intellectual sciences. The "philosophy of nature" was made subordinate to the "philosophy of spirit", and this was no doubt the result of the rationalistic presupposition upon which the system was based. *A priori* speculation tends to take precedence over observation and experiment. Reason is still considered as an activity which produces and therefore explains all facts. But the facts of man's complex experience must be investigated without prejudice and without presupposition. Reason, to be sure, will have its place, but alongside of it or alongside of the processes

denoted by that word will be other processes just as important and just as essential. Modern experimental psychology, since the days of Hegel, has vindicated its right to be the propaedeutic to philosophy, and it is mainly because Hegel was not able to enter the domain of philosophy through the gateway of an adequate psychology that the system of absolute idealism does not to-day occupy the same high pedestal that it once had.

That this idealistic development finds its main source in Kant's work is evident. That there are other tendencies, which may, likewise, claim to be, in a measure at least, the result of the critical philosophy is also true. Positivism, as taught by Auguste Comte, and furthered in England by John Stuart Mill and Herbert Spencer, emphasizes the positive sciences, which are placed over against a philosophy or a metaphysics considered as mere speculation. The first critique of Kant had shown the necessity of confining scientific knowledge to phenomena, and, although it was certainly not the author's final purpose, it had seemed, for the most part, to deny the possibility of any further knowledge. Under any circumstances, it was just this aspect of Kant's work that Comte emphasized. True positive knowledge is to be had of phenomena only. To observe the facts given in sense-experience, to determine by the help of experiment the relations of these and therewith to discover the laws of nature,—this becomes, practically, the sole task of all proper investigation. Such a work the different sciences are undertaking. Metaphysics has had its day. Its importance is now only historical, and, in its place, are the different positive sciences. Still, since the different sciences themselves have certain relations, it is possible to classify these, and this work a positive philosophy may undertake. Comte's classification commences with the most abstract science, and ascends to the most concrete. In this way we pass from mathematics, which is most general and most abstract, to astronomy, to physics, to chemistry, to biology, and, finally to the most concrete of all, sociology. Each of these depends upon the truths of all the preceding sciences. Certain of the sciences, the more concrete, have not developed so rapidly as others. The more complex and concrete a science is the longer it takes it to pass from a theological phase through a metaphysical to the positive. In the first of these phases, phenomena are supposed to be governed

and directed by gods. In the liberation of human thought from this anthropomorphic, theological stage, man passes next to the metaphysical, where, instead of gods, hypostasized abstractions are supposed to be the explanation of phenomena. The divinities are repudiated, but replaced by souls, essences, tendencies In modern times, however, the positive explanation of facts—the ascertainment of their actual relations—is gradually superseding the theological and metaphysical explanations.

Now these views of Comte, and those of Mill and Spencer which show the same tendency, have much to be said on their behalf. Perhaps the most important influence which positivism has had may be seen in the fact that philosophy, as a world-view, has been led to see more clearly than ever that it must not only take cognizance of, but must be based upon the results and procedure of the different special sciences. A philosophy, which is purely speculative, is not a true philosophy. A world-view must endeavour to explain the world, otherwise it soars among the clouds and is bound to prove inadequate.

The positivism of Comte, however, would deny the possibility of a world-view. Science deals only with the observed facts, philosophy is limited to the classification of the different sciences. But such a position overlooks part of the procedure of the special disciplines themselves. For, as we have seen, and as the history of the sciences is showing more and more clearly, theories or hypotheses are indispensable to the special sciences. The content of science includes the data which are perceived, but also in its explanations there are advanced theories and these, though they may and do change, are, nevertheless, part and an important part of science. This Comte's positivism tacitly ignored. When one remembers this, he is enabled to see that positivism does not give an adequate account of philosophy. The very attempt to classify the sciences presupposes a system in which these sciences are. The task of a positive philosophy, as advanced by Comte, is one part only, therefore, of the work of a true philosophy, a philosophy which cannot properly be limited as Comte would limit it. There is a task to be performed other than that of the mere classification of the positive sciences. It is a task which attempts to coordinate all the facts of experience into a system, into a world-view.

It is not difficult to see that idealism and positivism differ much in their aims. There is an even greater difference, however, between idealism and the New Realism, as it has been called. But here the contrast moves upon a different plane. It is based mainly upon the question of knowledge, and the crux of the situation lies in the distinction between the different conceptions held by each as to the relation of mind to its object. It is an old, old problem, one that has vexed mankind for centuries, and one which, if it is to be solved, must be approached by a path different from that which has generally been followed. It has been seen how idealism, in pretty close line after all with Berkeley, still claims that *esse est percipi.* The *percipi* of more recent idealists, however, must be extended to include all the activities of reason or spirit. Objects exist because there is mind. As T. H. Green, one of the recent Hegelian idealists would say,—It is the spiritual principle in knowledge and the spiritual principle in nature by which knowledge and nature are made possible.[1]

Now realism, whether English or American, is opposed to any such theory. Professor S. Alexander of Manchester University, in advancing his anti-idealistic doctrine says, "What is certain is that he who has any experience experiences two things. One is the object he is concerned with, and that is not his mind; the other is his act of experiencing, which . . . he comes to know as an act of that continuous tissue of mental events which is called his mind. . . . . When I am judging, I am together with some real, *i.e.*, non-mental connection of things, some fact of the world. Strip your mind of the prepossession that what you apprehend must be something dependent on your mind, . . . and you see that to have an experience is the compresence of the two things named".[2] "The table and I are together in precisely the same sense as the table and chair are together. . . Instead of the chair there happens to be I, who am a mass of experiencings. My perception of the table is thus the fact that there is a thing which can perceive and a thing which so provokes it as to perceive in a manner appropriate for perceiving a table."[3]

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[1] T. H. Green: Prol. to Ethics. Cf. Bk. I, Ch. I.
[2] Mind, N. S. 21 (1912), P. 2.
[3] Ibid. P. 3.

A very similar doctrine is held by a growing number of American writers. That this new realism is opposed to idealism is obvious. In an article published recently in the Journal of Philosophy, Psychology and Scientific Methods, Walter T. Marvin of Rutgers College claims that "the long and undisputed reign of idealism is about to enter upon troublous times". And this because "such a movement as neo-realism has already shown enough symptoms to make evident that it is opposed to idealism of every form and variety".[1] The agreement between English neo-realism, as represented mainly by Professor Alexander and Bertrand Russell, and the American neo-realism is, generally speaking, very close. The main point of difference seems to be that the former makes consciousness a "thing" among other things, a term among other terms, whereas the latter makes consciousness a relation dependent upon the terms related. According to Professor Perry, for example, "when an entity is known or otherwise experienced it is related to a complex".[2] The "complex" is the "knower", of which or of whom the new realism has little apparently to say; consciousness or knowing is not, as in the English writings, on a level with the thing known but is the relation between the knower and the thing known.[3]

In opposing idealism this recent teaching claims to be more in line with the natural sciences and common sense. There is, it claims, a real independent world which may become known but which is not produced or constructed or made possible by mind or consciousness. This extra-mental world is, of course, not the physical world of primary qualities of which Locke spoke. It includes both primary and secondary qualities, or, rather, no such distinction as Locke made is here possible. The real world is a world of colours, sounds, smells as well as of solidity, extension and movement. Blue, for example, is an aspect of this real independent world, and is there, in space, over against mind, or, for the American realist, over against the knower.

It seems evident that the philosophic system which the neo-realist will construct from such a standpoint must be much different

[1] Op. Cit. Vol. IX (1912), Pp. 309-10.

[2] The New Realism: Cooperative Studies in Philosophy, by E. B. Holt, etc. P. 126.

[3] Journal of Philosophy, Psychology etc., Vol. II, P. 309, The Relational Theory of Consciousness by W. P. Montague. Also Ibid. Vol. IX, P. 684, A Point of Difference between American and English Realism by M. T. McClure.

from that which is found in idealism. The idealistic tendency has treated mind as a spontaneous activity, a synthetic unity of apperception, a synthetic principle the function of which is to make knowledge and nature possible. The word is not used to stand for all the facts or certain abstracted facts of experience. Now the realist advises the idealist to strip himself of such a "prepossession", but, if the realist himself, instead of advancing a new theory of what the mind is or, at least, tacitly assuming a different view thereof, had commenced by an analysis of actual facts, and then had clearly stated to just what facts he was going to apply the word mind or the word knower, many misunderstandings and much argument might be obviated.

Surely neo-realism, English or American, as well as idealism needs to examine more critically the actually occurring experience, and, for this reason, the importance of experimental psychology, as a preliminary study, should be more fully recognized by both schools. To neglect such a preliminary study is to reverse the proper order; it is to begin construction by theory and supposition rather than by the sharp and clear-cut analysis of given data.

The neo-realist assumes that there is a "pre-existing and independently existing" world, which forms an "environment" for consciousness.[1] He thinks that only thus can the work of the natural scientist be understood. Such a real world is not one of space and time and movement only. Realising the impossibility of explaining by these, colours and sounds and smells, the neo-realist goes the whole way and posits independently existing objects to which belong the so-called secondary qualities as well as space and time and movement. Some of these objects under certain conditions may become known, but their becoming known is to them but an incident or happening. Now by what procedure does the neo-realist come to this position? What are the processes which precede and make necessary such a doctrine? These processes the neo-realist has not attempted to delineate. His assumption of an independently existing world is a preliminary assumption, and does not arise from any analysis of the actual operations of knowledge. Nor can it be in any way the result of immediate observation, for, even if it were certain as Alexander holds that he who has any ex-

[1] Cf. Present Philosophical Tendencies: R. B. Perry, P. 322.

perience experiences two things, one of which is a non-mental object, it would yet be utterly impossible for him to observe likewise that the non-mental object exists as perceived, or in any other supposed manner, by itself before and after it is known. Such an hypothesis can never in any way be proved, and yet, upon that hypothesis, the whole fabric of neo-realism rests.

If it be said that it is only by such an assumption that the nature of our scientific knowledge can be explained, then all one asks is that that statement be proved. And to do that requires that the operations of knowledge be first thoroughly investigated without assumption or presupposition. After such an investigation, one may then, if necessary, legitimately make use of theory or hypothesis without incurring the danger of having one's whole investigation vitiated by preliminary suppositions. Even before this analysis is made and at the risk, therefore, of being himself charged with dogmatism, one may, nevertheless, venture the statement that the neo-realistic conception of an independently existing real world can never be a tenable theory simply because such a world must itself be a product of thinking, and, as such, can never transcend all thought. It may nevertheless be necessary for the complete understanding of the facts of science and morals and religion to posit objects which transcend sense experience, and such objects might then quite properly be called transcendent; but it must not be supposed that they would transcend all experience, all thought. They would be in no sense extra-mental, whatever that can mean, and it would become a genuine problem to determine more fully the nature and relations of such transcendents.

The history of these recent developments, and indeed the whole history of philosophy teaches us this important lesson,—any system of philosophy to be adequate and to be scientific must build upon the solid foundation of fact. And this recalls the conception of philosophy which, in an earlier chapter, resulted from our survey of the first great philosophers. Philosophy was there defined as the scientific attempt to form a world-view which gives a rightful place to all the known facts. It is the attempt to give a view of the world, but a view which has as its task that of coordinating into a system the stock-in-trade of the sciences, *i.e.*, their data, as well as the operations of the sciences. Such a system must have within it the

minimum of contradiction, and philosophy must ever strive to get rid of even this minimum.

Now all the sciences proceed by the investigation of some definite phenomena usually expressed by the phrase matters-of-fact. This investigation and these matters-of-fact must, therefore, be more closely delineated, and in the first place, reserving for a moment our account of the matters-of-fact, we may attempt to show the nature of the investigation which science pursues. This investigation exhibits two main general characteristics, which may be designated as processes of relating and comparing.[1] Of these two, relating is the wider and more abstract term, since there is no comparing possible without relating, though there may very well be a relating wherein no comparing finds a place. One may say, for example, that two processes within experience are related when it is seen that one follows the other in temporal sequence. But comparison takes place when the agreements and differences of the two processes, one with the other, are singled out. When these simple processes of relating and comparing are repeated and combined there arise certain more complex processes which have been named synthesis and analysis. Between these there is no strict line of demarcation. The former however is more closely dependent upon the relating function, and the latter upon the comparing function. Upon a given complexity analysis operates and by determining the agreements and differences within the complex there are obtained as the product of the analysis the elements of the complex which are generally termed concepts. The process itself is called a judgment, and judgments find expression in sentences.

Now, because it is necessary to commence first of all with the originally occurring complexity of experience, the first process must be analytic in form. By analysis there is separated out, in thought, what was originally united. It must not be supposed however that by such an analysis the unity of experience is in any way destroyed. Thought always presupposes such a unity, and the conceptual objects that result are abstract objects, which, though never found as abstract in the original experience, are, nevertheless, derived therefrom. Synthesis is exhibited in the conjoining of these analy-

[1] Cf. Wundt: Outlines of Psychology, III Rev'd Engl. Edn., Par. 17

tic products into greater complexities. To these processes of comparing and relating, of analysing and synthesizing the general term, thinking, is frequently applied.

In such propositions as "the sun shines", "sugar is sweet", there are to be seen the simplest kind of judgments; these are based upon the immediate unity of perception, whereas in such judgments as "the sun is a heavenly body", "sugar is a chemical compound", judgments have arisen which are based not upon such a unity but upon a conceptual unity. The first class of judgments does not presuppose already formed concepts of the sun and its brightness, of sugar and its sweetness, but the immediate perception of the shining sun or the sweet sugar has secured the focus of attention and thus the judgment occurs. In the second class of judgments, concepts of objects are related, concepts which have been previously determined by the examination of different judgments of the first class. In such operations of thought there are obtained three kinds of concepts, concepts of objects, concepts of attributes, concepts of states, and, corresponding to these are the three grammatical forms of substantive, adjective and verb. The various relations in which these concepts stand to one another in the judgment constitute the different forms of judgment. These latter may undergo many transformations, and may have various connections all of which will still be varieties of judgment so that the whole procedure is really an interconnection of judgments. We thus have new relations arising between such judgments, and it is with these relations, common to all science, that logic is concerned.

Now the relations expressed by the different forms of judgment are reducible to two basic relations, that of identity which may be total or partial and that of dependence which may involve the dependence of one concept upon another or may involve, possibly, the mutual dependence of concepts. Before one can predicate identity or equality between any two concepts, he must first discover the agreements and differences which are present. In such a process of comparison concepts are declared to be equal if, for the prevailing purpose in hand, the agreements outweigh the differences. There is, of course, no such thing as absolute identity, since the concepts are always at least two. If again, on the other hand, the differences are emphasized, then the concepts are declared to be

opposed. So then there develops immediately out of these two operations of thought, *i.e.*, the detecting of agreements and the detecting of differences, two of the so-called laws of thought, viz., the law of identity and the law of contradiction, including, likewise, a third which may best be considered as subordinate to and resting upon the other two. The first of these states that throughout the various differences of any concept there remains a certain agreement or a certain constant. The second emphasizes the fact that the differences are so great that the concept can no longer be regarded as the same concept. The first is expressed symbolically as follows: $A = A^1 = A^{\wedge}$; the second may be expressed thus—of the two propositions A is B and A is C, both cannot be true when B and C are contradictory or contrary. The law of excluded middle, sometimes considered as a third law, may be represented by the formula A is either B or C. There is no third possibility, simply because it is here assumed that B and C are all the possibilities, in other words they are contradictories. On account of this limitation this law is seldom operative or helpful in the sciences. The first of these laws rests upon the ascertaining of agreements, the second upon the ascertaining of differences, and the third is really a subsidiary law based upon the other two and so resting finally upon both the ascertaining of agreements and the ascertaining of differences.

Thus upon these two operations of thought, corresponding to that relation of identity, total or partial, which is one of the basic relations of all judgment forms, rest the above-mentioned laws of thought.

But not all concepts can be said to stand in a connection of total or partial identity one with the other; there is also a relation of dependence between concepts. We do not predicate identity of any kind between the length of the radius of a circle and its circumference, or between the raising of a body to a certain height and the falling of the same, yet there is, we say, a relation of a special kind. This relation grows out of the spacial juxtapositions and temporal sequences which we observe, and, as a result of these, there is formulated the law of dependence, or law of sufficient reason or cause and effect, as it is sometimes called. According to this law concepts are united in a relation of dependence.[1]

[1] For a more detailed discussion of the psychological origin of the laws of thought, cf. Wundt: Logik, Vol. I, Pp. 548-565, and also his System der Philosophie, Pp. 58-75.

This abbreviated presentation of the so-called fundamental laws of thought is not so much a prescribed form, obtained in some *ex cathedra* way, and imposed upon scientific procedure in a manner somewhat analogous to the way in which the categories of Kant have been supposed to be imposed upon sense-data, but rather it is a presentation of what occurs in every single scientific procedure regarding any matters-of-fact whatsoever. The task of logic is simply to represent this procedure, that which actually occurs in the progress of science, in a schematic or symbolical form. It is to be regretted that too often logic has been regarded as providing a canon which scientific knowledge should and must follow, whereas, in fact, logic can only obtain such a canon from the actual course of scientific knowledge itself. These laws of thought then are simply that which is common to all sciences however diverse may seem to be the matter with which they are concerned. And philosophy, when once it exhibits such common principles, has already made a step, and a great step, toward a unified view of the world.

Of course this is only what might be called a splendid beginning, for we have still to do with—to follow an ancient usage—what is called the matter of science, in other words, its content, as distinguished from the principles of thought outlined above. Here we have the question, what are, then, the contents of the various sciences. In other words what are the matters-of-fact with which they deal.

But still further, there arises out of the foregoing another question, viz., whether or not human thinking, investigating matters-of-fact according to the laws of thought, can predicate anything not found in such a content nor in such laws but to which both that content and those laws are supposed to be somehow related. This is the question of the transcendent, The articulation of these three questions into a system constitutes the task of philosophy.

To work out in detail anything like an answer to these would be entirely beyond the projected task of this thesis, since such a working out would be the presentation, in detail, of a system of philosophy. Such an attempt would be presumptuous within the limits of a work which has regarded as its main purpose the attempt to discover what, in the history and present stage of human know-

ledge, should be taken as the content of philosophy and the nature of its task. It is, therefore, only necessary now to outline the way in which philosophy ought to set about its task.

In searching for an answer regarding the content of the sciences there is really involved the problem of the classification of the sciences. This problem philosophy will best solve by an historical retrospect of the way in which the scientific disciplines have been ramified and elaborated. The historical survey already sketched shows this much, at least, that the individual sciences have all arisen from the observation, classification and explanation of definite matters-of-fact, in the general use of that term. No one would be so absurd as to maintain that the sciences begin *e vacuo;* they all arise from the consideration of observed phenomena. And since, as has just been seen, all sciences follow certain common modes of procedure, the delineation and systematization of which constitute the work of logic, there will be general agreement in regard to what constitutes the starting-point of the sciences and their mode of operation.

The next stage in the development of science is manifestly the explanation of observed phenomena physical, chemical, biological, etc. Here, wherever possible, resort is made to experiments wherein data may be observed under definitely known conditions. By such experiments, whether they be themselves "natural" operations, or whether they are considered as analogies or epitomes of what occurs in the greater laboratory of nature, the cause of the phenomenon in question is regarded as ascertained. In this procedure, the close relation of the various sciences becomes apparent, for, when they come to the last stages of explanation, it is seen that they use concepts which have much in common. It is the formation and use of such concepts which are of extreme importance for a philosophical inquiry, for the unification of scientific results into a world-view. The point to be insisted on, however, is that such concepts are the specific product of human thinking. They are not among the origina' data which formed the starting-point of the special sciences, but are end-results, termini, which are not absolutely final but always capable of modification and finer definition. The rise and operation of these concepts, concepts like matter, force, energy, atom, void, etc., must be carefully and pro-

perly scrutinized by philosophy. For it is the business of philosophy, including herein the scientist's critique of his own progress, not stupidly to deny these nor dogmatically to assert these but to understand them. And furthermore, philosophy must try to comprehend what the empirical scientist is doing when he takes such concepts—the products of his own thinking—and posits them as existing independently of his own thinking, a positing which, itself, is still the scientist's own operation.

In this regard the operation of science has produced a curious puzzle. For, aside from the fact that it often tries to explain the data of its own original starting-point as the effects of the action of these hypostasized concepts upon a sensitive organism, *i.e.*, the human body, as for example, when it tries to explain sensations and ideas by reference to hypothetical physical and physiological processes—aside from this fact, there is this still further one, that science has postulated entities or "realities" as existing independently of and absolutely different from all human thought. This leads at once to the intricate problem of the idea and the object. If it be granted that such independent realities are totally different from sensations and ideas, then the former can never be known by the latter. It is of course possible to say that such realities are still known being cognized somehow by other processes than those consisting of sensational and ideational categories. It must be freely admitted that this is a view which has generally been held. The rationalistic movement of scholasticism and, specifically, that of the seventeenth and eighteenth centuries advanced just such a claim, a claim which Kant however endeavoured to show to be utterly unjustified. But even if such realities could be apprehended in this way by thought, the reply of thousands of idealists, whose views are not to be contemptuously set aside, would be that such realities, therefore, cannot be entirely foreign to thought. Whether such an argument be cogent or not, it is quite manifest that here we have a problem to solve, and, if the solution should turn out to be vain as it has in the attempts of the past, we shall then be driven back to the inquiry, how in the first place in the history of scientific thinking we came to predicate such a contraposition of idea and object, a contraposition which, in effect, was an opposition, for idea and object were regarded as utterly different from each other except

that the former was supposed to be in some mysterious fashion a copy of the latter. It is at any rate clear that science and philosophy have made such a predication. How they have come to do so is a profoundly interesting historical investigation, an investigation which will show that in the formation of the problem philosophy has had as great a share as science, if indeed not a greater.

In all the forms in which this puzzle has been presented, whether of matter and mind, physical and psychical, body and soul, there has remained the unbridged and, we venture to say, unbridgeable gulf of dualism,—unbridgeable, because of the antithetic way in which the two have been defined. For when each is supposed to be totally different from the other, as in the philosophical views of Des Cartes and thousands of his modern successors, there is no way as yet known to man by which they can become united. Under any circumstances it is clear that the content of the sciences includes the observed data, with which they commence, as well as intellectual interpretations or conceptual constructions based upon these data.

But in these conceptual explanations of observed data there is often the resort to the predication of that which is neither found among any perceived data, that is among any matters of perceived fact, nor regarded as being in any way perceptible, the predication of that which cannot possibly be known,—to use Kant's phrase. This is the scientific use of the transcendent, a use which philosophy should patiently examine.

For when, in the work of philosophy or science, we speak of the infinity of the universe in space and time, and connected therewith of course the Ideas of unlimited matter and unceasing causality, we make use of terms which do not designate anything perceptual or conceptual. Hence such terms as those just mentioned are considered as transcending the observed data as well as the concepts derived therefrom, though, to be sure, they are supposed also to be in some kind of relation to them. Following the Platonic and Kantian usage, these transcendents may aptly be called Ideas, to distinguish them from concepts. By these Ideas science is able to make some completion to its treatment of the facts investigated. And it is part of the task of philosophy to make a scrutiny of these Ideas in order to see how they arise and what function they perform. Here it may be seen how these different sciences approach a position

similar, in some respects, to that which characterizes another investigation, viz., the religious inquiry, which philosophy must also consider. For among the sciences the results of which an adequate system of philosophy must synthesize is the science o religion. And in the religious facts observed and classified and explained by this science there are those which refer to that which is considered divine, and this is, like the infinity of the universe in space and time, as predicated by mathematician and physicist, usually considered as transcendent to, though at the same time related to sense-experience.

Because of such ultimate approaches among the different sciences, natural and intellectual, the task of philosophy to construct a system in which the operations and results of all the sciences are coordinated is much facilitated. But such a system of philosophy need never expect to be entirely final and ultimate, simply because the sciences upon which it must be built should and no doubt will develop.

In conclusion, therefore, it may again be pointed out that the aim of this thesis has been merely to indicate wherein philosophy and the sciences are definitely related, and to base the claim for such a relation upon an historical survey of both. To perform such a synthesis as that wherein the task of philosophy has been found to consist would be naturally a sequel to this thesis and lies beyond its present limits. It is, however, here sufficient, finally, to affirm that philosophy, if it be true to its task in the sense assigned, can be neither stagnant, dogmatic, biassed nor eclectic, but must keep pace with the scientific attainments in the intellectual development of the race.

# VITA.

I, Roy Balmer Liddy, son of Rev. James J. Liddy, M.A., Methodist minister now of Brantford, and his wife Kate Frances, was born in Bradford, Ontario, in the year 1885. My High School training was obtained in Oshawa and Harriston, and my early teachers, especially Principal Lyman C. Smith, B.A., and Mr. E. T. Slemon, B.A., I shall always hold in appreciative remembrance. After a few months spent in teaching, I entered The Dominion Bank, in which institution I remained for some four years, leaving that work in the fall of 1908 to enter the University of Toronto as a student in the second year in the honour course of philosophy. After graduating in Arts in 1911, I was made Fellow in psychology, and during the sessions of 1912-13 and 1913-14, I held the position of Demonstrator in the psychological laboratory. During a period covering about four years I have taken the examinations in the subjects constituting the Bachelor of Divinity course in Victoria College, and in April of this year was given the degree of B.D.

My registration for the degree of Doctor of Philosophy dates from the fall of 1911. My first minor has been Banking, taken in the Department of Political Economy. For the suggestive and helpful lectures given on that subject by Mr. S. A. Cudmore, B.A., I am very grateful. My second minor has been the general topic, History of Philosophy, while my major has been The Relation of Science and Philosophy, taken under Professor W. G. Smith, of the Department of Philosophy. Work in this last subject was commenced in the session 1911-12, and in May, 1912, I submitted for the M.A. degree a thesis entitled: Some Considerations of the Relation of Science and Philosophy. Throughout the three years which have been spent pursuing the study of the major subject my work has been under the direction of Professor Smith, and, though I owe much to the other members of the staff in philosophy, I shall ever be deeply indebted to his keen yet sympathetic criticism as well as to his constant supervision and encouragement.

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